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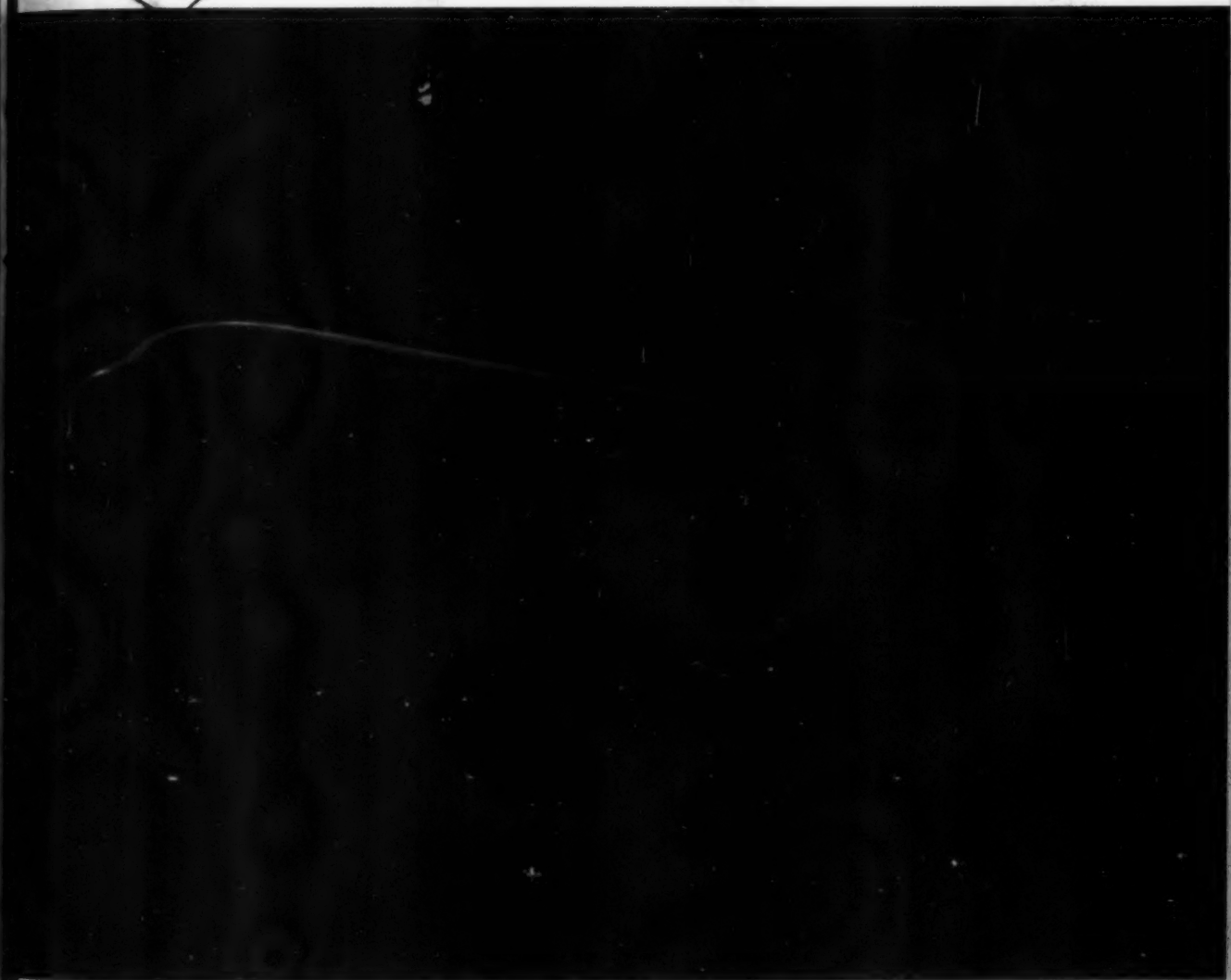

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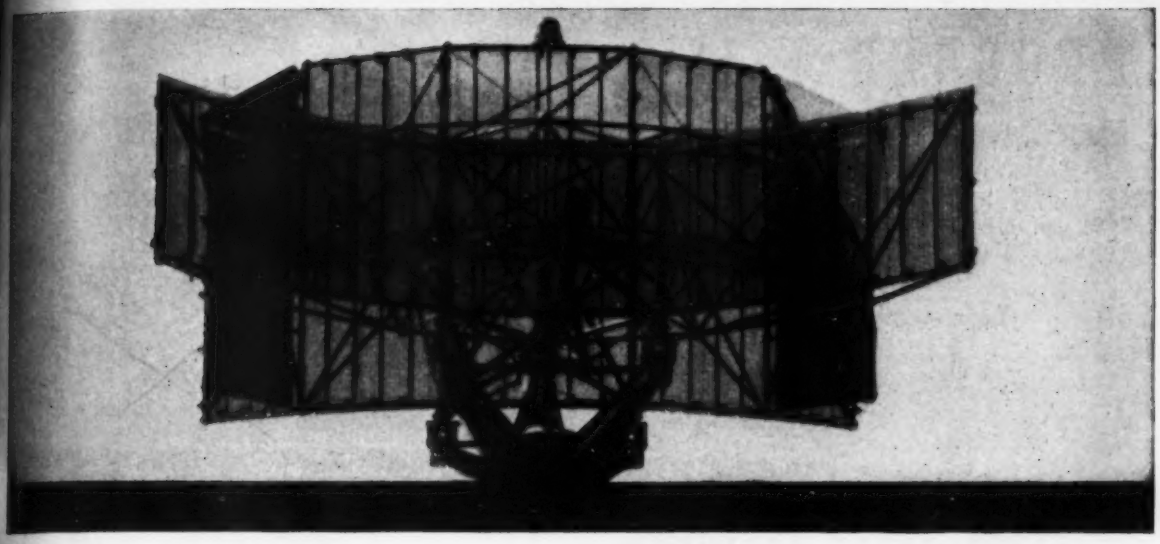

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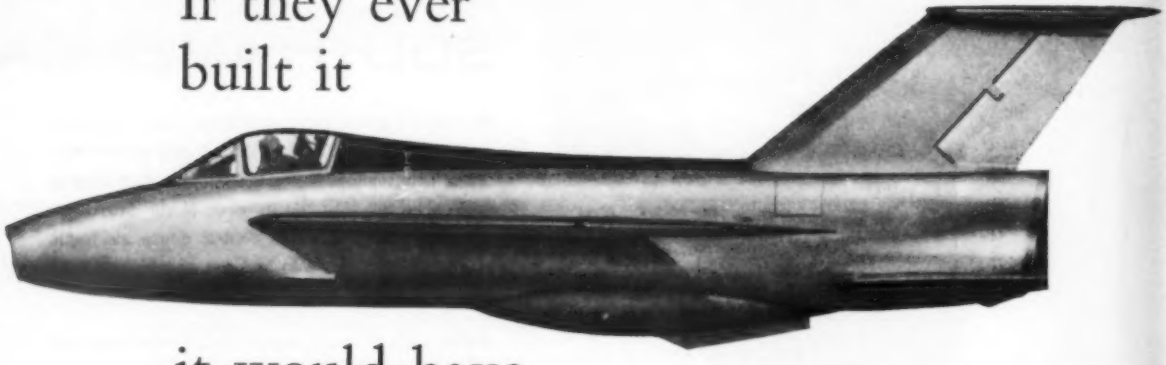

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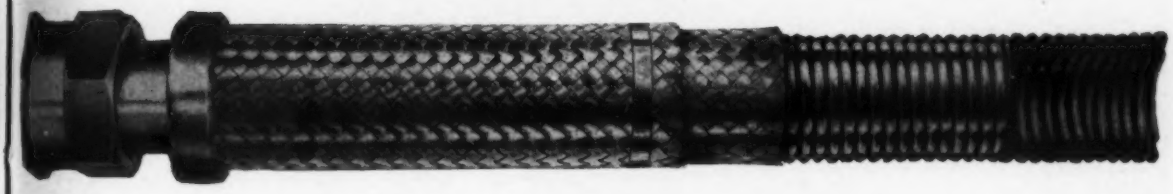

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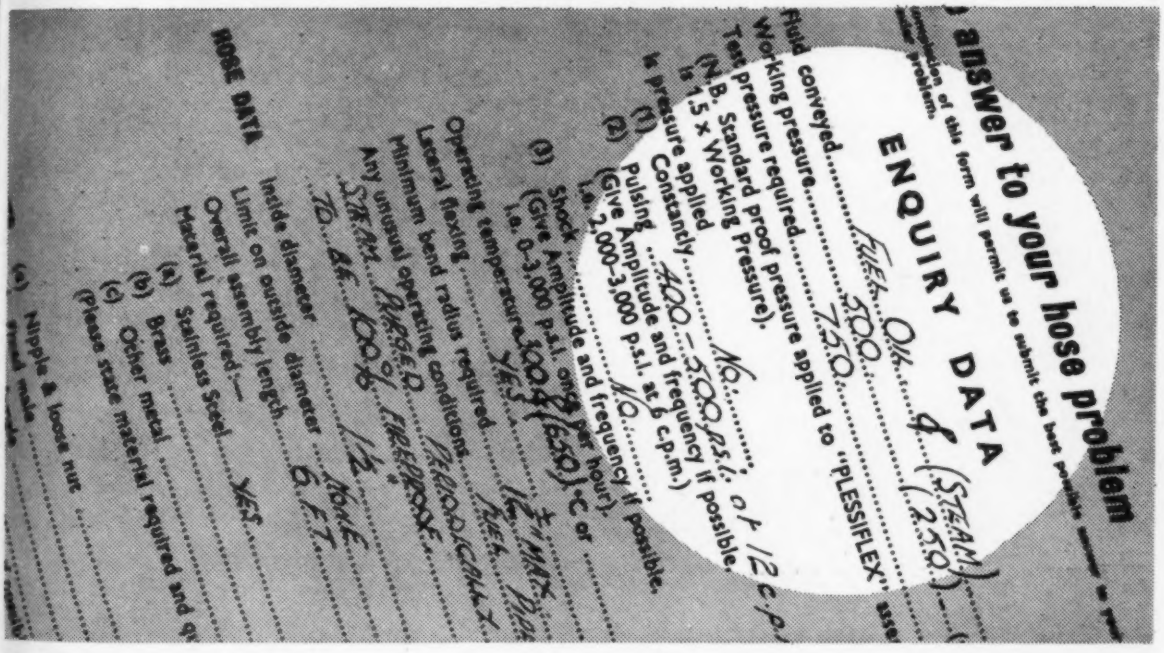

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Europe in Space

EUROPE is getting into the space business. In scientific research and in the development of a heavy launch vehicle, the events of the past few weeks have shown that the planning is going well. Two weeks ago at Munich, the Preparatory Commission which is laying the foundations for the European Space Research Organization (ESRO) reported a detailed eight-year scientific programme agreed by the representatives of eleven countries. Last week in London, Mr Thorneycroft's salesmanship homework on the subject of Blue Streak was marked in Europe's school—seven out of a possible ten, with Sweden, Norway and Switzerland abstaining (but with Australia as a bonus) in the plan to develop a European launcher based on the British vehicle.

As reported exclusively in last week's issue of *Flight*, ESRO plans to set up a European Space Technology Centre and a Data Centre (at locations yet to be decided), and a northern firing range for sounding rockets at Kiruna, Sweden. For its medium-term and long-term projects involving Earth satellites, lunar orbiters and deep-space probes the Organization will buy the most suitable launch vehicles, whatever the source. For four firings it will need a heavy launcher such as the proposed European three-stager; while for thirty others a Scout-sized medium vehicle is required. These will all be launched from existing ranges such as Woomera and Hammaguir.

The programme of the proposed European Launcher Development Organization calls for the first firing of the complete three-stage vehicle in the summer of 1965. This would be preceded by test flights employing dummy upper stages, and would be followed by two further complete firings, all at Woomera. Although personnel from all member-countries might work on each of the vehicle's three stages, the respective leaders would be Britain, France and West Germany. This organization does not intend to launch operational satellites except incidentally as part of the development of the launcher.

Means to an End

This leads to an important question. Who, then, *will* be launching Europe's operational, non-scientific satellites—that is, satellites with practical applications such as communications, navigation and meteorology? Mr Thorneycroft was singularly vague at his press conference last week about who, apart from ESRO, is expected to buy and use Europe's own launcher. It is not sufficient merely to say, in effect, "we are building a launcher so that we shall not be excluded from those countries building launchers." A rocket launch vehicle, like any other, is a means of transport: it is the means by which something is accomplished, and is not an end in itself. Unless Europe intends to place "application" type satellites in orbit she should think twice about developing and making heavy launchers of the type proposed—and to say this is not to minimize the technological and political importance of the programme.

This gap in spacecraft development—between the launch-vehicle-builders and the space scientists—was illustrated ironically last week by the staff reductions in the astronautics section of Hawker Siddeley Aviation. An opposite extreme applies in the United States where, in the single field of communications satellites, no fewer than five separate civil programmes are under way.

Appropriately directed, Europe has a powerful potential in space, as ESRO is admirably demonstrating in its own field. But the "application" spacecraft gap is serious, and one which might well be tackled by the launcher organization in two ways: first, by a widening of interest to include satellite and spacecraft operation; and, secondly, by increasing collaboration with the USA.

FROM ALL QUARTERS

Indian Avro 748 Flies

"WATCHED by thousands," said a cable from Kanpur, India, to Hawker Siddeley on November 1, "the 748 made first flight today. Everything perfect."

Pilot on this first flight of the Indian-built Avro 748 was Sqn Ldr Kapil Bhargava of the Indian Air Force, which is constructing these aircraft at Kanpur for service as general-purpose transports. The licence agreement was signed in Delhi in July 1959 by Mr Krishna Menon, Minister of Defence, and Sir Roy Dobson, HSG managing director. The first aircraft has been assembled in IAF-built jigs from components sent from Britain, but the Kanpur plant is now busy installing all the machine tools and other equipment required for complete manufacture. The Rolls-Royce Dart engines for later Indian-built 748s will be produced under licence.

BAC and Continental VTOL Project

IT is reported—unofficially at the time of going to press—that British Aircraft Corporation are submitting a joint proposal with the Italian company Finmeccanica for a heavy VTOL transport aircraft for NATO. Dornier Werke are also reported to have been approached with a view to taking part in the project. The aircraft is apparently based on the Bristol 208. The latter aircraft was discussed in *Flight* for June 1; the NATO NMBR-4 transport contenders were contrasted on October 12.

This would represent the first BAC venture into the European field. Finmeccanica incorporate Aerfer, which proposed a transport similar to the Transall at the Paris Salon two years ago. Dornier are in the Atlantic programme, but not in the Entwicklungsring Süd, which is developing a VTOL fighter.

HSA Astronautics Chief Leaves

DR W. F. HILTON, head of the astronautics section of Hawker Siddeley Aviation, has been dismissed by the company—together with several members of the section—as a result of reduced HSA activity in the field of spacecraft payloads. Dr Hilton's section, originally part of the HSA Advanced Projects Group at Kingston, has recently been merged with Hawker Siddeley's Blue Streak team headed by Mr Geoffrey Pardoe of de Havilland and based in London.

A Hawker Siddeley Group spokesman stated that the staff reductions followed the lack of any Government support for projects such as the communications satellites on which Dr Hilton's team had been working. Although not explicitly stated, it appears clear that Hawker Siddeley effort in the field of space is being concentrated on the Blue Streak vehicle in its expected application as first stage of a European launcher.

FAI Officials Elected

AT the recent general conference of the Fédération Aéronautique Internationale at Monaco, M Jacques Allez was re-elected president for a second term; Dr W. Muri was re-elected first vice-president; and M Jean Blériot re-elected treasurer-general. Col R. L. Preston of the RAeC was elected a vice-president.

The Astronautics Committee, presided over by Mr D. J. Lyons of Great Britain, reviewed rules adopted previously for the certification and registration of records by manned spaceships; amendments were made, and once the rules have been printed they are to be made public. The International Sporting Committee discussed a proposed new international competition for touring aircraft; a suitable formula still remains to be adopted. Next year's conference is to be held in Athens.

At the general conference distribution of medals and awards the FAI Gold Medal was awarded to Maj Yuri Gagarin of the Soviet Union.

ASSET Wants Supersonic Airliner

A CALL for Government support for a British supersonic airliner was made last week by the Association of Supervisory Staffs, Executives and Technicians, which has 7,000 members in the British aircraft manufacturing and operating industry. The union called for a Government plan for the industry, sections of which were, they claimed, working overtime while factories such as those at Portsmouth, Christchurch and Chester were threatened with closure.

Handley Page Profits

RESULTS announced by Handley Page Ltd for their financial year show a pre-tax profit of £253,363, compared with £159,917 for the previous year. Taxation charges have, however, increased from £8,514 to £62,971; so the net profit is £190,392, compared with £151,403 for the previous year. Expenditure on Herald development written off during the year amounted to £247,214, compared with £347,081 for the previous financial year.

TEST PILOT appointment with the de Havilland Engine Co Ltd goes to Mr J. L. Barnes. Originally with Airspeed Ltd, he joined the RAF in 1951 and eventually became a Boscombe Down pilot. His extensive experience on both helicopters and fixed-wing aircraft well qualifies him for flight-test duties on the Gnome Whirlwind and the Gyron Junior powered Buccaneer and Javelin

The Fairey Year

CHANGES made by the Fairey Co in the last two years are reflected in the company's profit-and-loss account for the year ended March 31, 1961. Trading profits, less losses of the group before charging depreciation, are £484,911 compared with £1,116,410 for the year ended March 31, 1960. The chairman, Mr G. C. D'Arcy Biss, emphasizes in his statement that this year's results are not comparable with those for the year ended March 31, 1960. That year's trading results included a dividend representing nine months' profit from Fairey Aviation, which was sold to Westland Aircraft in December 1959. Subsequently, Fairey acquired Siebe, Gorman & Co and profits of this company for 15 months (to March 31, 1961) are included in this year's results; but as it is a smaller unit than Fairey Aviation its profits only partly offset those previously earned by the aviation business.

Mr Biss also reports that group results for the year have been seriously affected by losses in the Belgium subsidiary Avions Fairey SA, totalling £242,000, and in Aeroplastics Ltd, of £126,000. Losses in Avions Fairey are mainly attributed to delays in settling the F-104G Super Starfighter contract.

EIGHTY YEARS YOUNG, Dr A. P. Thurston celebrated his birthday on October 31 by a flight in an Airedale with Mr Peter Masefield, Beagle's managing director. Dr Thurston worked with Sir Hiram Maxim on his "captive flying machine" in 1902

SILVER MODEL of the Buccaneer was presented to Wg Cdr W. J. Laidler (chief test-flying instructor at the Empire Test Pilots School) by Mr B. P. Laight (Blackburn director and chief engineer) when ETPS staff and pupils visited the company's works at Brough

Belvederes in Service

AT Odiham last Monday the RAF showed off the first of their operational Westland Belvedere squadrons, No 66. This is commanded at present by Sqn Ldr J. R. Dowling, formerly CO of the Belvedere Trials Unit, from which the squadron has been formed. Coming at present under 38 Group, which is commanded by AVM P. G. Wykeham and whose headquarters are at Odiham, No 66 is due to go out to the Far East next year. Two more Belvedere squadrons, Nos 72 and 26, are being formed; one is destined for service in Aden and the other will be UK-based. With a load-carrying capacity of 5,000-5,500lb and ability to lift up to 28 troops, these machines form a useful addition to RAF capability in tactical-support operations.

The aircraft being used by 66 Sqn, which has six, differ in certain respects from the pre-production Belvederes evaluated by the Trials Unit. They have powered controls, metal rotor blades, a slightly modified tail unit and low-pressure tyres. The Napier Gazelle 101s are unchanged.

Each Belvedere operated by 66 Sqn carries two pilots and a crewman who is also a technician, responsible for maintenance away from base. The pilots converted to Belvederes generally have had previous helicopter operational experience; their 20 hours' conversion flying includes basic experience on type, and tactical application.

In a demonstration on Monday a Belvedere landed 18 RAF Regiment troops, then with two others lifted a Land-Rover and trailer, two one-ton containers and four 1,000lb netted loads. A Mexe bridge weighing 4,250lb (just under two tons) was transported and deposited for a simulated river crossing.

AIRBORNE AVIAN: Since March this year the Canadian Avian 2/180 gyroplane has completed over 200 flights from Waterloo-Wellington Airport, near Kitchener, Ontario. Flight testing continues, with certification expected next year

Wanted: New Projects

A FORTHRIGHT plea for more long-term support for the aircraft industry was made by Sir Roy Dobson, managing director of the Hawker Siddeley Group, at Boscombe Down last Friday when representatives of the industry were entertained to dinner by the Aeroplane and Armament Experimental Establishment. Stressing that some companies' financial commitments were far bigger than they should be asked to carry without support; that foreign countries might ask for five, six or ten years' credit; and that the lead the British industry had established couldn't be maintained without assistance, Sir Roy suggested that the Government should be persuaded to tell the industry what it wanted seven or more years ahead. Without new projects the industry was not going to be able to keep up its annual £150m worth of exports.

Earlier, Sir George Edwards had sounded a similar theme, counterpointed with some sharp aphorisms. The managing director of British Aircraft Corporation said that he and Sir Roy had in common "some fairly majestic burdens"; emphasized that Britain couldn't do without an aircraft industry—whatever the politicians might say; summarized the occasion's "nostalgic atmosphere of aeroplanes and chaps who make and fly them"; and reminded his hearers that the last time it was held (1958) was the year after the 1957 Defence White Paper.

Sir George said he hoped all those present who were not in the aircraft industry would feel sorry for Sir George Gardner, Controller of Aircraft at the MoA, who was to propose a toast to it. But the Controller stuck to the safe ground of historical reminiscence, going back to Sir George Cayley and the Wright Brothers. In a brief forward look, he said he considered there was a long future for manned aircraft, and a tremendous chance "for us in the industry at this time."

Air Cdre J. F. Roulston, AOC and Commandant, said in his opening remarks that they were delighted to have so many of their contacts—including famous designers and test pilots—as guests. One famous figure who could not be present, Sir Frederick Handley Page, had nevertheless armed him with a typical "HP" aphorism—that "though there might be a lot of other aeroplane builders about there were not many who could speak about as many good aeroplanes as he could." Though Boscombe Down's functions had changed over the years its aim was still, said the Commandant, to provide the Services with "the best at the earliest."

IN BRIEF

A memorial service for the late Lady Cobham, wife of Sir Alan Cobham, was held at St Stephen's Church, Bournemouth, last Saturday.

This year's annual reunion of the Air Public Relations Association will be held at the Royal Air Force Club, Piccadilly, London W1, on November 16.

We regret to learn of the death, at La Jolla, Calif, of Mr Harry Woodhead, who was president of Consolidated Vultee Aircraft from 1942 to 1948 and general manager of Douglas Aircraft in 1948-50. Mr Woodhead was born in Britain in 1890 and moved to America as a young man.

A symposium on crack propagation, sponsored by the College of Aeronautics and the Royal Aeronautical Society, was held at the College of Aeronautics, Cranfield, from September 26 to 28. It was opened by Air Marshal Sir Owen Jones, RAeS president, and an introductory review of fundamental thought on the subject was given by Prof A. H. Cottrell of Cambridge University.

A new attempt on the Sydney-to-London solo speed record is to be made next April by Ron Flockhart, flying a Merlin-powered, Australian-built Mustang. The attempt is stated to have the backing of the Royal Aero Club, many firms in the British aviation industry, and the Australian authorities. Mr Flockhart made a similar attempt last March, but engine trouble caused its abandonment at Rome.

Rotax Ltd announce the appointment of Mr R. H. Woodall, MIEE, FRAeS, as an assistant general manager with specific responsibility for sales and engineering. Technical director since 1949, Mr Woodall has been closely associated during the last 30 years with major electrical developments in the aircraft industry, and he was awarded the Royal Aeronautical Society's Taylor Gold Medal in 1956. Mr J. H. Rea, BSC, AFRAeS, now appointed to the board as technical director, joined Lucas in 1929 and transferred to Rotax in 1939, being responsible for the development of rotating machines and later becoming known as a prominent member of their technical sales team. He has been chief engineer since 1952.

Col R. L. Preston has relinquished the chairmanship of the historical group of the Royal Aeronautical Society and has been succeeded by Mr J. L. Nayler. The society's librarian, Mr Frank Smith, is at the moment undertaking secretarial duties for the group.

Bristol Siddeley exhibits at the Indian Industries Fair, which opens in New Delhi on November 14, will include the Pegasus lift/thrust ducted fan engine, Orpheus and Viper turbojets and the Thor ramjet. Among other British exhibitors will be Normalair Ltd, whose display will feature their range of cabin air-conditioning, pressurization and oxygen breathing apparatus.

We record with regret that AVM F. H. McNamara, VC, CB, CBE, died last week at the age of 67. He won the Victoria Cross—the first gained by a member of the Australian Flying Corps—in March 1917 in Palestine when he landed behind enemy lines under Turkish fire to rescue a fellow-pilot. During the last war, one of his appointments was that of AOC RAAF overseas headquarters in London; then he became AOC British Forces, Aden.

Canadair Ltd have signed an agreement with Microcell Ltd, a subsidiary of BTR Industries, under which the Canadian company will have the right to manufacture Microcell aircraft passenger seats in Canada and America and to sell them in all parts of the world except Britain. Under the same agreement Microcell have given Canadair production details of a new seat stressed for 16g, forward or aft facing, specified for CL-44s and CL-28s of the RCAF. Microcell also retain rights to produce this type of seat.

Sperry Gyroscope Co, Brentford, Middx, are supplying fully manœuvrable aircraft attitude and heading reference systems for the Dassault Mirage IIICs for the RAAF. They were among overseas suppliers mentioned in Canberra last week by the Australian Minister for Air, Senator Harrie Wade. The Sperry system consists of twin gyro platforms with Rotorace suspension gyros, an electronic pack and controller flux-valve unit. Value of the order may be estimated at about £500,000. Other firms named by Sen Wade included Computing Devices of Canada (position and homing indicator system) and the French CSF Company (fire control system).

The Birth of the Big Aeroplane

SIR FREDERICK HANDLEY PAGE LOOKS BACK

A COMPARATIVELY large audience in the Royal Aeronautical Society's Lecture Theatre on October 30 heard Sir Frederick Handley Page reminisce—the only suitable verb, for he certainly did not lecture—on *The Birth of the World's First Big Aeroplane*. Sir Owen Jones, the president of the Society, took the chair; and an H.P. atmosphere was created from the start when Sir Frederick gently put him right on one or two points of fact in the biographical notes with which he had been supplied.

In his introduction Sir Frederick gave dates to indicate the length of his association with aeronautics—he joined the Society in 1907, he read a paper 1911, and so on.

The need for a large aeroplane was first felt by the Royal Navy and in 1914 Sir Frederick started his association with the Air Department of the Admiralty when the Department was housed over Admiralty Arch. The consulting engineer with whom he was in contact was Harris Booth, a man of slightly eccentric ways, one of which was a habit of changing into carpet slippers for the office. Captain [later Rear-Admiral Sir Murray] Sueter was in charge of the Air Department and Captain Schwann was second in command. Also connected with the Department was Cdr Samson who, reporting back from the scene of war, asked for an aircraft that would be a "bloody paralyser." This request was backed up by Winston Churchill, and a specification was drawn up and conveyed to H.P. on December 25, 1914.

The requirement was for a machine to carry a crew of two, 6 × 1cwt bombs, and having a speed of not less than 75 m.p.h. It must fit into a shed 75ft × 75ft × 18ft to the eaves; anything larger would have to have folding wings.

The arrangement of the two 200 h.p. engines led to some argument in the drawing office, but it was finally decided to fit them one on each side of the fuselage with the propellers rotating in opposite directions. Harris Booth called for a 5lb/sq ft loading. A further requirement was armour plating as a protection against *rifle* fire. The first aircraft accordingly had 10-gauge plate on the front and 14-gauge on the side. Total weight of the plate was 1,200lb. In this first machine, the seats were so placed that the engineer (who was given a rifle) could stand over the pilot (who was in a wicker basket chair) and protect him from attack.

The design team had, in the first place, to design a machine of some 13,500lb gross weight as against the 3,000lb of the average contemporary aeroplane. This in spite of the fact that Lanchester had laid down a limit, so the lecturer said, of 1,100lb (11,000lb?). Limited to 5lb/sq ft, a 1,500 sq ft wing surface (biplane) was decided on. The span of the upper wing was 100ft, that of the lower 80ft and the chord of the RAF 6 section was 10ft. As Sir Frederick said, "We gave it a long tail—there's nothing like a nice long tail."

All the components were broken down as a percentage of the whole, and weight-savings made wherever possible. The significance of grain direction in wood was not at first appreciated and as a result some components had to be rebuilt. It was finally found that percentage structure-weights came out much the same as those for the smaller aircraft built hitherto. This was due to the more efficient design of members.

At last the machine was ready for transfer to Hendon for the trial flight. This was a Naval operation, and the towing along the road was done by ratings under petty officers and officers. For a start there was a series of tyre bursts, due to such causes as failure to secure the tyre properly to the wheel. At Colindale Avenue the street lamps got in the way. These were dismantled—leading subsequently to a row with the local gas company, who were referred to Admiralty. It was by now nearly midnight. Next, trees interfered with the machine's passage and were lopped as necessary. No complaints ensued. The party finally arrived at Hendon at about 5 a.m.

The aeroplane made its first flight at Hendon on December 17, 1915. Apart from minor troubles, such as the misting of the glass in the cockpit and the failure of a magneto, the machine behaved well.

The design was later improved by the scrapping of the armour plating and a rearrangement of the cockpit, and the machine then reached a speed over 70 m.p.h.; but now there was considerable tail oscillation with a movement of 9-12in. It was found that slack control wires were allowing flutter. This was corrected, and an order was received by the company for four aircraft at £6,400.

A subsequent step in design was to fit engines turning in the same direction. Originally they had been fitted to rotate in opposite directions to counter torque, and also as a relic of the original design of the Wright brothers.

At this point Sir Frederick showed two slides of a machine that had been hit by gunfire. Pieces of fabric hung down like the sheets of an unmade bed. Further slides showed the adaptation of bombers to passenger use, with such refinements as wicker armchairs and a rather cruder version for conveying Service pilots abroad. The more "luxurious" versions were for delegates to the Paris Peace Conference.

In 1917 Lord Weir, the Air Minister, sent for Handley Page and asked for an aircraft to fly 600 miles out and back. By April 1918, at Harland & Wolff's factory, it was ready to fly. The firm had a strike on its hands, so it was brought to Cricklewood. It crashed on its trial flight and all on board were killed with the exception of Alec Ogilvie (who had flown with the Wrights and is alive today). Nevertheless, 100 of these machines were ordered for the purpose of bombing Berlin; but peace negotiations were in train and the order was not needed.

The Afghan War broke out and a four-engined machine dropped a 112-pounder on a harem wall—"thus striking a blow for female emancipation in Afghanistan." On the homeward flight two of the four engines failed but the aircraft reached base, where it was finally dismantled and the fuselage was used for an office.

A succession of slides showing H.P. machines ended with the Herald, which gave Sir Frederick an opportunity of mentioning his anti-speed-for-speed's-sake doctrine and extolling the virtues of a money-spinner. This brought him back to the original method adopted with the first big aeroplane—"solve the problem of each component on its own."

CLOSED-CIRCUIT AT 1,482 m.p.h.

Alexander Fedotov

FROM "Soviet Weekly" comes this note on the recent attempt—successful subject to FAI confirmation—on the world closed-circuit speed record by Alexander Fedotov in the Soviet E-166 delta-wing aircraft. The writer is M. Donisov.

AT Tushino airfield near Moscow recently, Pilot Alexander Fedotov set up a new world speed record in flights along a 100km closed circuit. Flying a Soviet E-166, he achieved an average speed of 2,385km/hr (1,482 m.p.h.), and registered 2,730km/hr (1,706 m.p.h.) over separate sections. This exceeds the record of US pilot Cdr John F. Davis, who about a year ago covered the 100km circuit at a speed of 2,237km/hr (1,398 m.p.h.).

The brilliant feat of A. V. Fedotov, 30 years old and a native of Stalingrad, was made possible by the intensive work of a large group of aviation workers. The performance data of the single-seat E-166 delta-wing aircraft, with great thrust and many new features, instilled confidence in its success.

One serious problem for the pilot was that at the great speed, nearly treble that of sound, the slightest deviation from its course could shoot the aircraft off the flight-path it had to follow over the check-points, and thus nullify the results. Altitude had to be not less at the end of the circuit over the check points than at the beginning. There were also other condition which Fedotov had to observe absolutely.

The E-166 took only a few seconds to gain altitude in a steep ascent and reach the stratosphere. After completing the manœuvre for directing his aircraft at the first reference-point, Fedotov began to gather speed. On the ground, observers watched his flight with the help of radar and telemetric devices. At the observation stations the air was broken by incessant aerodynamic shocks. Defying heavy stresses, the pilot kept the machine strictly on course and succeeded in keeping to the pre-set route.

The aircraft instruments showed an outside temperature of almost −60°C, but the skin was heated and in the cabin the temperature was maintained at the normal level. When descending the pilot cast a glance at the surface of the delta wing and saw that it was covered with tiny wrinkles.

The flight lasted for only 15min. The Chkalov Central Aeroclub of the USSR is sending data to the International Aeronautical Federation for registration as a world speed record.

The Breguet Atlantic at Toulouse Colomiers during the naming ceremony. Below, the traditional champagne bottle at the moment of impact

Breguet's Atlantic Makes its Bow

BY MARK LAMBERT **"FLIGHT" PHOTOGRAPHS**

WITH full military honours, and before an audience of VIPs from all the participating NATO nations, Mme Messmer, wife of the French Minister of Armed Forces, named the Breguet Atlantic at Toulouse Colomiers last Friday.

Several companies of *paras* in their dappled battledress greeted the Minister's motorcade with its motor-cycle outriders. Gathered in the hangar were a hundred or so high-ranking representatives of the nations taking part in the production programme. The military and civil formalities having been completed, the official speeches began. The Atlantic stood, so neatly painted and fully equipped that it might have been a regular squadron aircraft.

I have seen many French formal occasions and this one followed the traditional pattern—except when the proceedings began to centre on the aircraft, to see which we had all gathered from most parts of industrial NATO Europe. This has been a success story, a NATO joint programme which has worked effectively and produced a tangible result which is obviously good. The Atlantic prototype is a fine achievement; and it is one of those prototypes which has flown faultlessly since it first took the air. Since October 21, Bernard Witt, Breguet's chief test pilot, with Perineau, his flight test engineer, have made something approaching 20 flights. They had tried stalls in all configurations during the third flight, and at Friday's ceremony they made demonstration fly-pasts on one engine. In accordance with present French policy, this first prototype was fitted with a large proportion of its operational equipment, including electronics, autopilot and weapons racks.

When I visited Colomiers in April to see the 941 STOL transport, the prototype Atlantic was "under wraps" across the hangar. Now it is flying, and the second prototype is structurally complete and being equipped in the same part of the hangar. It is to fly next March. There were rumours that a large order was to be announced at the naming ceremony; but it was stated only that orders were expected in the first half of next year for aircraft to be delivered in 1964.

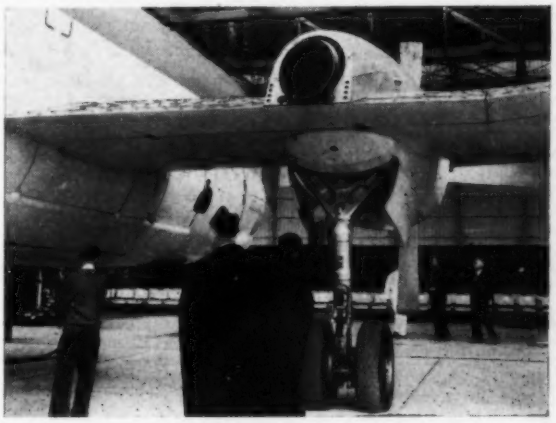
If the Atlantic had been a purely French and Breguet project, its history to date would have been creditable. The surprising fact—and even those in charge sounded just a little bit surprised—is that 14 nations co-operated successfully in the original planning of the aircraft, seven have been involved in the construction and five have been concerned in the financing.

The story began five or six years ago when NATO formed a steering committee to draw up a specification for a standard maritime patrol aircraft. Cmdt René Bloch, present chairman of the committee, told in a crisp, lively speech how the initial prospects had been poor. Other efforts at standardization had been none too successful, but it was realized that this project *must* work if the whole concept of joint design was not to fall by the wayside. It was as important for Europe as for NATO. The team had to learn not only what to do, but how to do it. They finally wrote a detailed specification and called for proposals. Eleven designs were submitted and, after the most careful and impartial assessment, the Br.1150 was selected in October 1958. The French Government immediately ordered prototypes and the detail design and construction got under way in Holland, Belgium, Germany and France. Now, Breguet's recently signed agreement with Grumman makes a US Navy order not impossible.

Britain was content to soldier on with the Shackleton, and Canada had just procured the Argus, so Avro pulled out of the Atlantic programme, to the chagrin of the other countries and the detriment of the British airframe industry. Rolls-Royce, on the other hand, continued their stated policy of working on a European scale and supplied the Tyne turboprops. De Havilland joined in with the propellers. The first three Tynes for the first prototype have indeed been loaned, but those for the second have been bought. Six more, for the third and fourth prototypes, have been ordered.

The NATO steering committee, on which Canada and Britain were represented as observers—the RAF has said it would replace Shacklетons only with Atlantics—planned a completely new search, identification and attack system for the Atlantic, incorporating the best equipment offered in the US, Canada and Europe. The menace of missile-equipped, high-speed, long-endurance submarines to the NATO maritime countries is obviously acute, and only the Atlantic had the speed, range, equipment and offensive capability to deal with them. It is regarded as something of a key weapon in this field, although it is capable of working effectively with surface ships, helicopters and smaller aircraft in the hunter-and-killer rôle. It can fly for between 12 and 18 hours, can cruise fast at

The Hispano gear, Rolls-Royce Tyne jet-pipe and wool tufts on the wing. The civic dignitary is examining the externally mounted bomb doors



One of the interchangeable beams on the rails in the weapons bay. The wing centre-section is in the background

Breguet's Atlantic Makes Its Bow . . .

330kt at altitude, for which the crew compartment is pressurized, and patrol at 170kt. Loss of an engine at any time after take-off will not affect completion of the mission. Although the equipment is the most modern available, the overall cost has been kept as low as possible for the sake of the less affluent nations who will operate it.

The steering committee includes representatives of all the nations taking part, each member being chairman for six months to preserve impartiality. Mr H. Bloss, head of the aircraft section at NATO HQ, is permanent vice-chairman. Breguet, as leading company, have produced a great number of guide-books on common methods and standards, specifications and tolerances for all the other participants. They construct the fuselage themselves and Dornier and Siebel make the tailcone and surfaces; Sud Aviation make the outer wings; Fokker the centre section and wheel wells; ABAP the power pack; Hispano Suiza have designed the undercarriage and make it with SABCA and FN. Hispano also have the licence rights for the 6,105 h.p. Tyne RTy.20 Mk 21 and will make it with FN and MAN. The French company has all the tooling, but some components will still be made by Rolls-Royce. Ratier have the licence for the D.H. propellers, and the accessory gearbox is by Dowty-Rotol. All these components, and probably part of the airframe, would have been made in Britain had we decided that a replacement for the Shackleton would be required.

It has been the steering committee's task to produce the detailed specification; and Cmdt Bloch referred to the difficulty of getting five nations to accept common altimeter, radar and other equipment. But all aircraft will be identical and interchangeable. Despite the manifold investigations and decisions involved, Parkinson's Law was not allowed to intervene, and the numerous sub-committees and working parties were dissolved as soon as their tasks were completed.

So the first prototype was assembled at Toulouse and flew three years to the day after the Breguet design was first chosen—and ten days ahead of the originally scheduled date.

The basic data so far released include a gross area of 1,291.7 sq ft and aspect ratio of 11 for the relatively thin wing. Ceiling is 33,000ft and range 5,000 miles. Top speed is given as 330kt, but 300kt was mentioned at the ceremony. Gross weight is given as 41 tonnes (90,400lb) but "over 42 tonnes" was mentioned. Tyre pressure is given as 128lb/sq in, but "136lb/sq in" is painted on the undercarriage (like the NATO F-104G, the Atlantic is liberally stencilled in our own international language). Span and length of the present machine are 124ft and 89ft 5in, but I was told that the production Atlantic may be slightly longer.

CSF have contributed the search radar in a retractable dome aft of the nose gear. The Doppler radar aft of the bomb bay may be by Marconi. Bendix and Sperry are also there, together with a Canadian company, probably by virtue of the excellent Antac tactical system already produced for the Argus. The fine Hispano undercarriage carries Kléber Colombes dimpled tyres and non-skid brake units. Kléber Colombes also supply the pneumatic de-icing boots on wings and tail. About 25 aerials of various kinds are fitted, including two radio altimeter units and IFF blade under the tail. Electronic, electro-magnetic and visual search systems are provided, all controlled from a seven-man operations room aft of the flight deck. Two pilots and an observer occupy the nose, but the aircraft commander is in the operations room with a complete visual situation display before him. Normal crew is 12 men, and a rest room and kitchen are provided.

The Atlantic is designed to carry any of the stores of the NATO navies, including bombs, mines, homing torpedoes, depth-charges, nuclear weapons, flares, markers and sonobuoys. Missiles can be carried on two underwing pylons. The doors of the 30ft-long bomb bay roll up on tracks over the outer skin of the fuselage, two sections overlapping each other in way of the wing root. Stores are carried on gantries which can be rapidly changed and positioned along full-length rails in either wall of the weapons bay. The gantries are probably of many different types and can be pre-loaded so that store complements are interchangeable. Aft of the bay two endless chain elevators hold buoys or markers which can be dropped through narrow hatches in the sides. Aft again, outside the pressure cabin, is a conventional tubular chute for flares; and a static line and clip were fitted in the prototype.

Main access to the pressurized crew compartment in the upper portion of the double-bubble fuselage is by trap-door and ladder under the tail and through the rear pressure bulkhead. Two visual-search blisters already had their binocular sights fitted. A secondary crew exit and bale-out hatch is in the floor of the flight deck, with a ladder leading down through the nosewheel well. Two escape-hatches are in the otherwise windowless operations area. The only test instrumentation in evidence was a small loom of orange cables in the weapons bay and two airstream direction vanes at the nose. An ice-detection probe was already in place.

It was evident from the complete absence of tabs and aerodynamic balances that the Atlantic has powered controls in all three axes. Inside the weapons bay, among the push-pull rod control runs, the levers and a cable quadrant of an autopilot servo could be seen on the rear face of the wing centre-section box. Pressure refuelling nozzles and banks of control switches in each mainwheel well were marked for JP-1 fuel. It is clear that the upper fuselage is unobstructed by the wing centre section. No bullet fairing for electronics—such as appeared in previous artists' impressions—is fitted at the top of the fin, but both wings have tip-fairings. The starboard unit contains a searchlight reflector.

A 200 h.p. Garrett-AiResearch turbine a.p.u. is mounted beneath the co-pilot's position, its exhaust surrounded by dabs of heat-detecting paint. The a.p.u. supplies d.c. and a.c. electric power, and air for starting the engines; its intake contains louvres which remain closed when the a.p.u. is not in use. Before starting the Atlantic for the demonstration a turbine g.p.u. mounted in a van was connected to provide electrical power, but the aircraft a.p.u. was also run. The Tynes were started and run in reverse pitch until the Atlantic taxied away.

Most remarkable structural feature of the Atlantic is the use of Breguet glued metal honeycomb panels for the whole wing torsion-box and pressure cabin, as well as for low-stressed areas such as weapons bay and undercarriage well-doors. This may be regarded in some quarters as a technical act of faith, but it certainly provides a remarkably clean finish. Outer wing panels are bolted to the centre sections by multiple bolts at the torsion-box skin, the recesses being simply covered by sheets of white adhesive tape.

The flaps extend over most of the trailing-edge, and the ailerons appear a fraction small, though they may be supplemented by spoilers. When Witt flew the Atlantic past at low speed he showed an adequate but not sprightly rate of roll. With flaps extended, the aircraft flew with its nose well down, but both landing and take-off appeared surprisingly short, even allowing for the low flight weight.

Altogether, the Atlantic is an impressive aeroplane. But Breguet had more to show. As soon as the Atlantic stopped after its demonstration, Witt emerged at the double from the tail hatch and was whisked off in a van to the remarkable 941 prototype, the engines of which were already running. He took control and proceeded to show off its singular capabilities, leaping off the ground in less than 100yd, turning in a circle of perhaps 250yd and landing in certainly no more than 70yd. With four Turmo IIIs and a clean aircraft he could fly fast; but with flaps down to 90°, and slats extended and the tailplane at an astonishing nose-up angle, he manœuvred the large machine almost violently at about 70kt. The short landing run was assisted by reverse pitch and powerful brakes on the four low-pressure wheels of the Messier Jockey undercarriage. Afterwards, Witt opened the rear doors and lowered the ramp before dashing over to give a second demonstration in the Atlantic. A versatile man, versatile aeroplanes, a versatile company. They deserve their success.

Breguet's other impressive progeny, the 941, looks on at the naming ceremony. Both the Atlantic and 941 were demonstrated by Bernard Witt

This Boeing B-52H, photographed during compatibility tests with the Skybolt missile at Wichita, is now at the USAF Flight Test Center at Edwards AFB for performance testing. Another B-52H at the Air Proving Ground Center at Eglin AFB has successfully completed drop tests of dummy missiles

Missiles and Spaceflight

EUROPE'S LAUNCHER GOES AHEAD

The Anglo-French proposals for the setting-up of an organization to develop and build a European three-stage launcher using Blue Streak as first stage, originally proposed at Strasbourg last January, have now been translated into a "final draft Convention" which has been agreed by delegates from six European governments and Australia in addition to Britain and France. The Convention has now been submitted to the governments concerned for final consideration.

This in essence was the result of the five-day conference held in the music room of Lancaster House, London, last week. A point not made clear by the Ministry of Aviation until the opening day of the conference was that those countries which had agreed to send delegates to the conference (*Flight*, October 12) had thereby agreed in principle to the Anglo-French proposals. The London meeting was therefore a formality at which the exact wording of the Convention was agreed, rather than a basic discussion of an open question.

Delegates from Australia, Belgium, Britain, Denmark, France, Italy, the Netherlands, Spain and West Germany attended, with observers present from Norway, Sweden, Switzerland, the Council of Europe and the European Space Research Organization. According to a Press communiqué issued at the close of the meeting:

"The proposals provide for the organization to carry out an initial programme of work for the development of a launcher using Blue Streak as the first propulsion stage, a French rocket as the second stage and a third stage to be developed under the leadership of the Federal Republic of Germany. The organization will also develop as part of the initial programme a series of satellite test vehicles to prove the launcher system. The programme provides for the first firing of the complete three-stage launcher to take place from Woomera in the summer of 1965. An attempt will be made in this trial to place a satellite test vehicle in orbit.

"The Convention provides for an elaborate programme of advanced studies to be carried out in the first two years of the initial programme with a view to formulating proposals for a second programme to be carried out by the organization. . . .

"Work will be carried out on behalf of the organization by means of contracts placed either by the organization itself or by the governments of member-States on its behalf. The allocation of contracts will be determined by the organization on the basis of a rational distribution of work among member-States, having regard to technical and economic criteria. . . ."

The Minister of Aviation, Mr Peter Thorneycroft, speaking at a Press conference at the end of the Lancaster House meeting, said that the organization had no plans to build any satellites other than the satellite test vehicles mentioned in the communiqué. It was possible, he said, that the European Space Research Organization might use the launcher when it had been developed (ESRO's eight-year programme, as reported in *Flight* of November 2, includes a total of four firings which would require a launcher of this class). Other applications, the Minister stated, were also "possible."

Replying to a question concerning the motive behind the proposals, Mr Thorneycroft said: "The object is to avoid a situation in which Europe is right out [of this field] . . . it gives us the opportunity of taking some part in the commercial advantages to be gained. . . ."

The launcher-development programme proposed at Strasbourg was described fully and exclusively in *Flight* of February 17, 1961. There had been no basic change in the proposed programme since the Strasbourg meeting, the Minister reported.

Assuming that Sweden, Norway and Switzerland remain outside the organization, however, there will be a change in the detailed arrangements for financing the programme. Britain's original commitment was to have been one-third (about £23.3m) of the £70m which the programme is estimated to cost. The absence of the above three countries leaves a gap of approximately £4.4m to be made up jointly by Britain, France and West Germany.

Discoverer 34 was launched into orbit from Vandenberg Air Force Base by the USAF on November 5. Recovery of a payload capsule was planned.

Revised performance figures for the first Saturn flight from Cape Canaveral on October 27 issued by NASA give the downrange distance as 215 miles and the impact point as "within ten miles of the planned target."

The third Skylark in a NASA series of four firings from Woomera achieved a height of over 100 miles on November 2. The rocket was fitted with a boost motor and the payload included instruments to study the intensity and distribution of ultra-violet radiation.

The Soviet Union completed its series of long-range rocket tests into the central Pacific with a firing on October 29. At once the Tass agency was authorized to state that the region—roughly 1,000 miles south-west of Hawaii and 1,000 miles north-west of Christmas Island—bounded by the co-ordinates announced on September 10 was once more open to sea and air traffic. In the original announcement it was stated that launchings would terminate on October 15, but on October 13 the programme was extended until October 30. Successful launchings were announced on September 13, 17 and 21 and October 7, 12, 15, 22 and 29. Each firing was stated to have been accomplished by a "multi-stage carrier rocket," that of October 7 being said to impact with extreme accuracy as a result of its new type of guidance system. In every case the range was given as approximately 12,000km (7,460 miles), and the penultimate stage of the carrier rocket was always claimed to strike the sea with "a high degree of precision." Nothing was said of any failures.

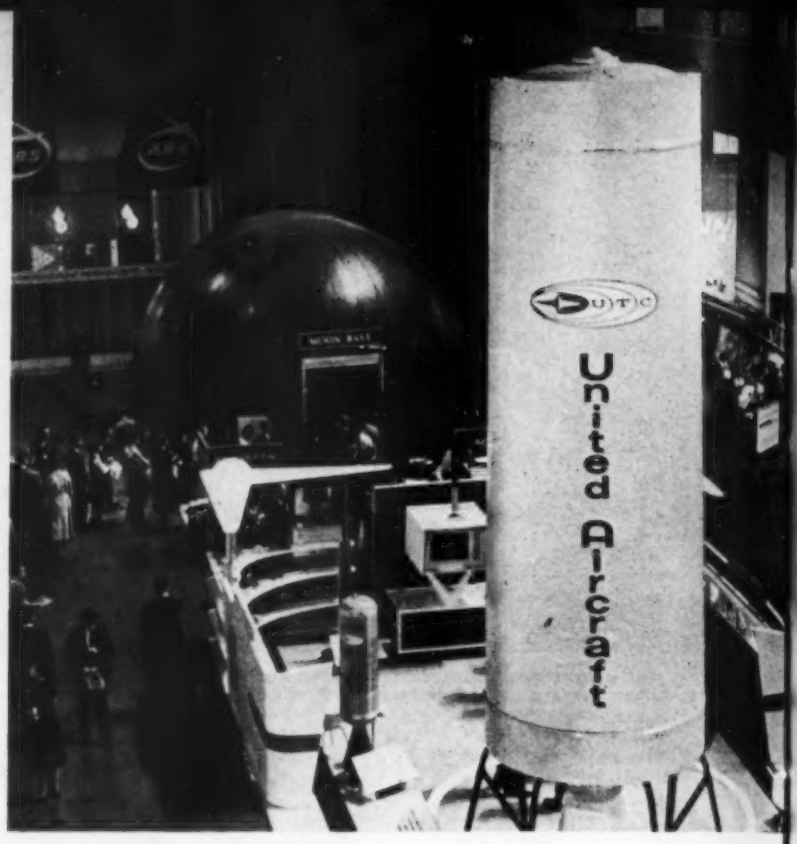
The USAF announced on November 3 that signals from the Midas satellite carrying the West Ford dipole experiment, launched on October 21, had shown that the dipoles had been ejected from the satellite but had not dispersed as planned. Attempts to locate the dipoles by radar had not been successful.

An attempted test of the NASA Mercury tracking network by means of a 150lb satellite in an elliptical Earth orbit failed at Cape Canaveral on November 1, when the Scout launch vehicle had to be destroyed by the range safety officer after it had "veered from side to side," according to Reuter. Up to four three-orbit missions for the satellite, which carried communications components similar to those in the Mercury spacecraft, had been planned.

Missiles and Spaceflight . . .

Sights of New York

BY KENNETH OWEN



"FLIGHT" PHOTOGRAPHS BY THE AUTHOR

Inside, and outside, the New York Coliseum last month. The heading picture includes the mock-up of UTC's booster-sized conical segmented rocket, and the Moon base constructed by Martin

"DEEP within Mt Cheyenne in Colorado," ran the notice, "United States Air Force Electronic Systems Division is creating an automated Combat Operations Center for North American Air Defense Command . . ."

Meanwhile, deep within the Coliseum in New York City, Burroughs Corporation had installed an actual piece of Mt Cheyenne —courtesy Utah Construction and Mining Co, NORAD excavation contractor.

The hunk of granite from Mt Cheyenne was without doubt the oldest exhibit on display at the American Rocket Society's 1961 exposition which accompanied the Society's annual meeting and "Spaceflight Report to the Nation" last month. It was more difficult to identify the newest exhibit, for everything else in the exhibition *was* new, from the ion engines and satellites of today to the spacecraft and model lunar bases of tomorrow—or perhaps the day after.

As might have been expected in an exhibition designed to appeal both to professionals and to the general public, the show was a mixture of technical interest and fairground gimmicks, wrapped together in glossy brochurity and tied with a Madison Avenue gift-wrap bow. Expected or not, the overall effect was startling.

The National Aeronautics and Space Administration occupied the large centrepiece area on the main exhibition floor. Highlight of interest here was the spiky, shiny blunt-winged insect that was the proof test model of the Ranger spacecraft—no mere display model, as Dr Pickering of JPL pointed out, but a working prototype that could have been flown. A few years ago the sort of thing one saw on the covers of the science-fiction magazines—now a duplicate of the craft that was at that time being readied for a half-million-mile flight on top of an Atlas-Agena at Cape Canaveral.

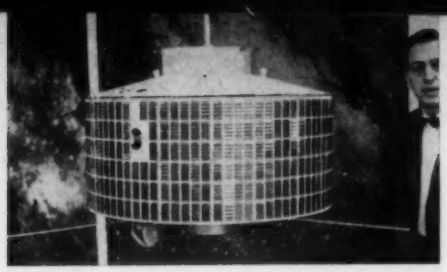
In smaller models, films and explanatory displays, the overall US civil space programme was illustrated. A cutaway model of a possible Apollo spacecraft, and another of the Saturn booster, showed what President Kennedy's accelerated man-on-the-Moon mission involved, while early Mercury capsule shapes, plus a capsule mock-up and actual control console, filled in some of the detail of this much-publicized programme.

On the McDonnell booth, also, Project Mercury was the theme. Visitors queued to look inside an actual capsule while the seven named, contoured couches were hung along the wall like the primitive space-age totems they are.

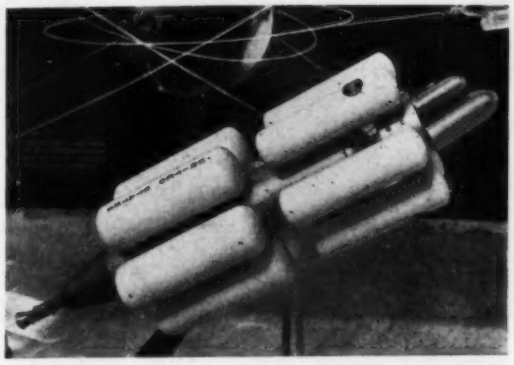
Although NASA had the central display position, Rocketdyne and United Technology Corporation vied with the space agency in sheer visual impact. Rocketdyne sales-talk was conducted beneath a mammoth full-scale mock-up of the business-end boat-tail of Saturn, the eight-chamber cluster periodically lighting up with what might be termed a ruddy glow to accompany a recording of a Huntsville static firing. As for UTC, a full-size mock-up, sliced down the middle, of the 30ft high segmented solid recently test-fired in California literally overshadowed the NASA exhibits.

Ryan showed a control-line "flex-wing" model flying round and round the salesman on the company stand. Scientific Industries Inc exhibited the ingenious Copernican planetarium, useful not only as a teaching and demonstration aid but also as a celestial analogue computer for orbital-mechanics calculations. A notice next to an enigmatic machine on the Plasmadyne booth read: "NEXT RUNNING OF THE PLASMA WILL BE 5.30."

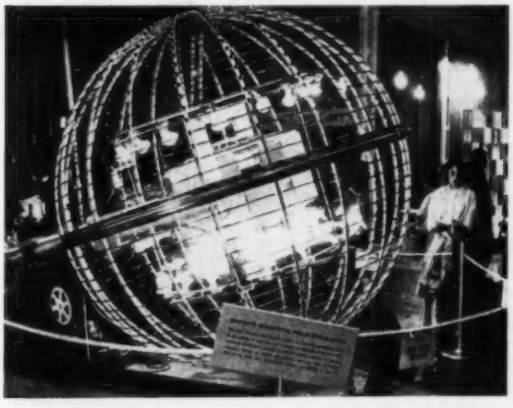
General Dynamics/Astronautics had a worthy selection of gimmickry, involving three young ladies with blue hair, a "launch a spacecraft to the Moon" sideshow and an invitation to "test your astronautical reaction time." Hughes Aircraft invited visitors to weigh themselves—on a set of lunar-weight scales.



Left, model of space electric rocket test (SERT) capsule being built by RCA for NASA's George C. Marshall Space Flight Center. Right, model of Hughes/NASA Syncom synchronous communications satellite



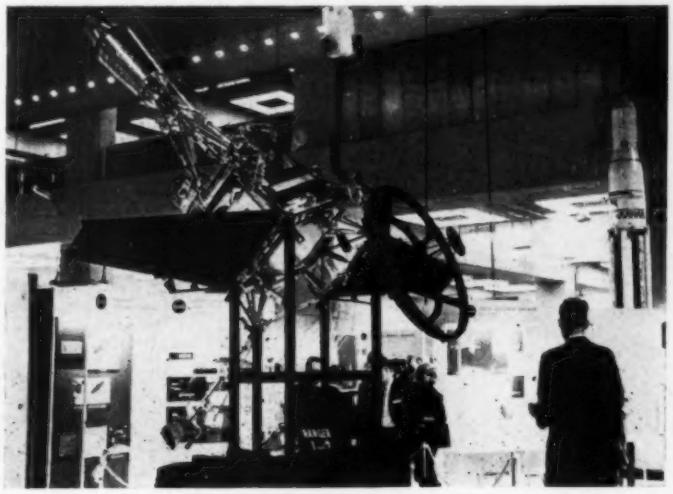
Left, Saturn boat-tail mock-up by Rocketdyne, and piece of Mt Cheyenne by Burroughs. Above, NASA model of nuclear rocket powered spacecraft which might take seven men to Mars

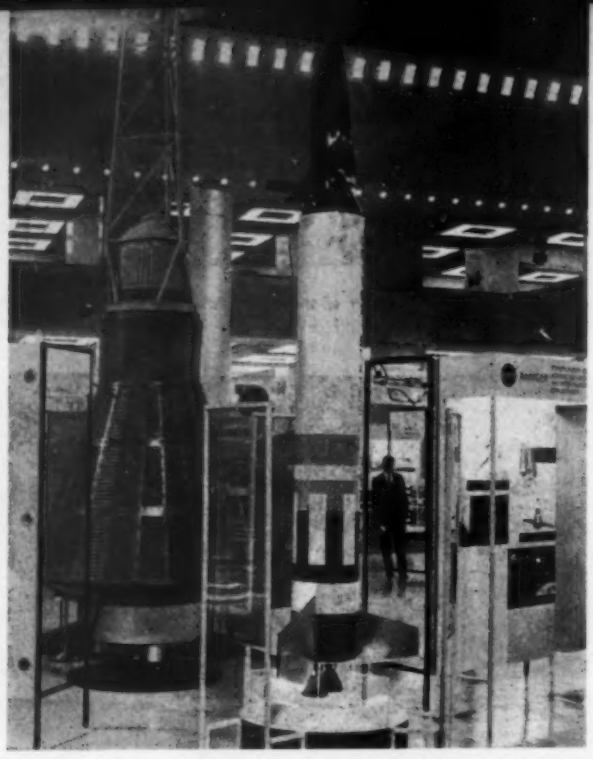


On our way to enter the swing doors into Martin's black-domed Moon-base we narrowly avoided colliding with a king-sized plastic beach ball, rolling along the aisle with a flat lid on top, labelled LUNAR ROVER. This was being controlled by a gentleman on the RCA booth via a small control box and a long wire. The Moon and the lunar surface was indeed a popular theme with a number of companies.

"Ascension to the Moon," also, was the theme of a singular presentation by Aerojet-General. Within one whittled-out sphere, reminiscent of an enlarged practice golf-ball, was a model of a NERVA nuclear rocket. Within another, Miss Donna Monroe gave her interpretation, dancewise, of the "Ascension to the Moon" theme. For some reason, the dance routine was changed midweek to a visual interpretation of the punchy Aerojet sales commentary being delivered over the loudspeakers. [*Continued overleaf*

Below, actual hardware—JPL Ranger proof test model on NASA display, with model of Saturn at right. Below right, upper stages of Saturn model. Above right, Earth's magnetic field simulator by RCA measures magnetic dipole of rotating Tiros-type satellite





Left, model of possible three-man Apollo lunar spacecraft shown by NASA. Right, a contribution by the Defense Department—Dyna-Soar model mounted on Titan booster. To the left in this picture is a NASA Mercury capsule, one of several on display

Laboratory working model of oscillating electron ion engine (United Aircraft Corp). Below, Nimbus/Aeros operational weather satellite model (NASA)

Missiles and Spaceflight . . .

"Grumman," a paragraph on a give-away package told us, "is proud to have been chosen to develop and construct the orbiting astronomical observatory for the Goddard Space Flight Center of the National Aeronautics and Space Administration. With this model [a cardboard cut-out OAO], we share our pride with the people of the United States." Another shareworthy offering was an Astroguide Navigator for Earth Orbiters, described as a geo-stellar projection matching system adapted as a slide rule.

"Exhibiting in depth" was a new technique introduced at this year's show. This meant that the aisles ran through the centre of many of the company stands, creating a "Come into my parlour" atmosphere in which escape for the visiting journalist from the spiderous PRO's web was made more difficult.

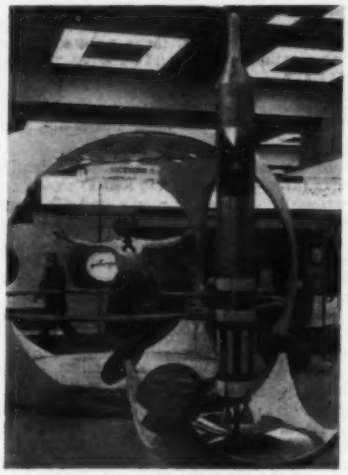
Not content with the impact of the Saturn boat-tail mock-up in the main display, Rocketdyne impressed with sheer size again in the parent North American Aviation stand on the ground floor of the three-floor exhibition. Here was shown a mock-up of a single-chamber 1,500,000lb thrust F-1 engine. For those interested in an overall view of aviation development, there was the Flicker Flash Theatre, showing "Progress" or "Where from have we come?" This was described in the programme as a "light-hearted approach to the history of flight, from balloonists to rocket pilots in a nickel-odeon flicker movie presentation, complete with sound effects and ricky tick music."

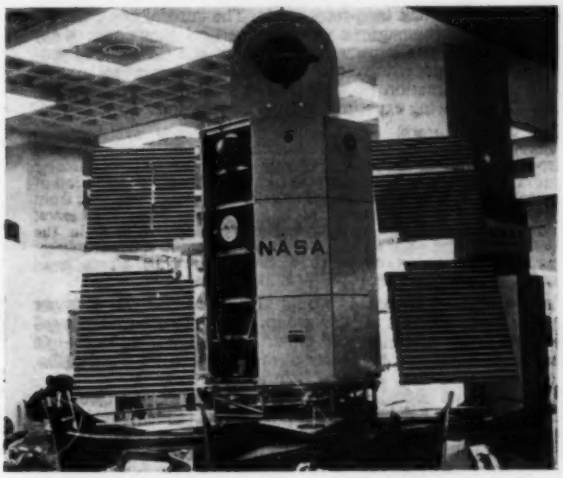
Other exhibitors nearby included the Boy Scouts of America and the State of Florida. Meanwhile, on the second (British) or third (US) floor, a young lady in an abbreviated skirt was dispensing cigarettes by courtesy of Northrop; Marquardt was urging "Scientists! See your experiment become a reality" (by means of Marquardt sounding rockets); and Callery Chemical Co invited passers-by to sit in on a rocket roulette game.

Well, I managed not to be recruited into the Boy Scouts of America, declined to emigrate to Florida, and was too busy taking pictures to settle down at the roulette wheel. I wasn't really in the market for a sounding rocket either, and, although it hardly seemed to matter at the time, I do not smoke.

But this was irrelevant. The sights of New York had proved photogenic and fascinating. The American Rocket Society's Spaceflight Report was good and loud, even if the noise of the report was muffled somewhat by the clicking ball on the roulette wheel, the clinking ice in the drinks at the company hospitality suites, the ricky tick music and the cries of those trampled underfoot in the rush for cigarettes on the Northrop stand.

Left, model of six-legged walking device for unmanned lunar exploration (Space-General Corporation). Right, mock-up of Rocketdyne F-1 engine (North American Aviation), with Atomics International Snap-2 nuclear reactor model in background

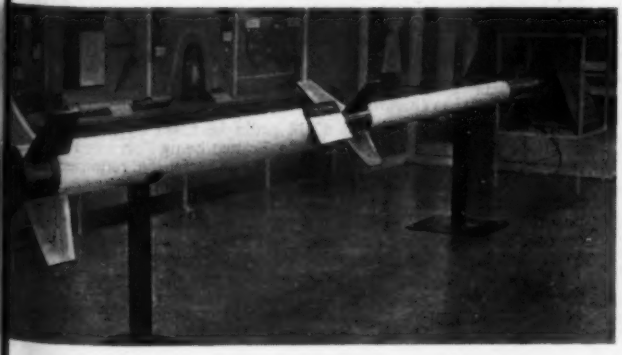




Left; Aerojet-General displayed Titan 2 model (right) and Miss Donna Monroe (for explanation, see text). Right, mock-up of the massive Grumman/NASA orbiting astronomical observatory, with six-inch Vanguard I satellite replica in foreground for scale

Technical topics presented at the Coliseum by General Dynamics Astronautics: Left, Miss Pat Hamer, who has blue hair, presides at GD's "hit the Moon" operation. Right, you are watching a person's response hesitation rate in a repetitious situation, it says here

Left, Gila-Kiva research rocket shown by Rocket Power Inc. Right, historical presentation by North American Aviation. As certain pictures on this page may have suggested to perceptive readers, the SBAC show at Farnborough was never like this. Well, hardly ever



Missiles and Spaceflight . . .

EUROPE'S SPACE PROGRAMME: Part 2

THE creation of a European Space Technology Centre is a major feature of the proposed programme which was discussed in Munich at the recent meeting of the European Preparatory Commission for Space Research. As reported in last week's issue, this centre would direct and co-ordinate the European Space Research Organization's short-term, medium-term and long-term projects. The detailed lines of investigation proposed are:—

Short-term Projects These are sounding-rocket experiments which could be quickly developed, but which would continue in parallel with medium-term and long-term work. The auroral zone, i.e. the region above 65° geomagnetic where the vertical component of the Earth's magnetic field becomes predominant and the charged particles from space penetrate closer to earth, is an important area of study on the interaction of solar activity with the Earth's atmosphere. The following experiments have been proposed:—

Glow below auroral forms; ultra-violet auroral spectroscopy; X-radiation in aurorae; corpuscular radiation in aurorae; very soft electron spectrum in aurorae; magnetic measurements; corpuscular radiation during polar cap absorption events; angular distribution of PCA protons outside the atmosphere; electron density distribution from propagation, impedance probe and Langmuir probe measurements; electron temperature; ion mass-spectrometry; negative ions in the ionosphere; ratio of negative ion to electron content in the ionosphere; temperature, density, composition and winds in the upper atmosphere; and primary cosmic rays associated with solar flares.

Many of these experiments would also be carried out at lower latitudes, forming a second main group. The third group envisaged covers astronomical studies, and in particular solar ultra-violet and X-radiation; lunar and planetary ultra-violet and infra-red radiation; and solar corona, zodiacal light and gegenschein.

The selection of rockets to be used for the short-term projects can be made only after a detailed analysis of all the requirements of the mission. Most of the vehicles used in this programme would be of the solid-propellant type, for simple servicing and short-notice firing. It appeared that payload capabilities ranging from 75kg (at a height of 300km) to 15kg (at 80km) would be required, and a standard rocket capable of carrying a 50kg payload to a height of 150km had been adopted as a convenient unit.

Also mentioned at the meeting were "proposals for the development of guided rockets which could be fired from restricted ranges in inhabited areas, and would be equipped with control systems for landing safely within the range."

Medium-term Projects Using small satellites, the following fields of study are proposed:—

Ionospheric studies using topside sounders, electron temperature probes, ion mass probes, RF spectrometer for observation of terrestrial transmitters by measuring terrestrial radio noise; radio-astronomical studies by measuring VLF noise outside the ionosphere, low- and medium-frequency (0.1-5Mc/s) cosmic noise, spectral distribution of cosmic noise over the range 0.1-20Mc/s, spatial distribution of cosmic noise at about 2Mc/s.

Measurement of atmospheric temperature, pressure, density and composition; studies of flux, energy distribution and angular distribution for proton and electron radiation associated with aurorae and polar-cap absorption; studies of primary cosmic radiation (electrons, protons, neutrons and heavy nuclei) by means of different techniques (emulsions and counters of different types).

Investigation of the solar X-ray and ultra-violet emission; magnetic measurements; detection of micrometeorites; geodetic measurements; and study of relative biological effectiveness of cosmic radiation.

Deep-space probes for medium-term projects are also envisaged, with the following preliminary objectives:—

Measurement of interplanetary magnetic fields; studies of cometary evolution and the effects of the "solar wind" and solar radiation pressure on comet tails by injection of suitable materials—gaseous comets, cometary nuclei consisting of about one ton of NH_3, CO_2, etc, in solid form, comets consisting of a few kilograms of the heavier earth-alkali elements, penetration of a comet head; studies of interplanetary plasma and of cosmic dust.

Long-term Projects ESRO's first major project would be the development of stabilized satellite astronomical observatories, with experiments including:—

Ultra-violet stellar spectroscopy to 1Å resolution in the range 1,250-3,300Å (a 20in mirror could be used for stars down to the fifth magnitude, and coarse guiding to 1min of arc and fine guiding to 4sec of arc would be required).

Soft X-ray stellar spectroscopy to give information on the dynamics and chemical composition of stellar coronae, etc; spectroheliography in ultra-violet and X-rays; study of fluorescence, absorption and scattering by interplanetary matter to give information on zodiacal light, gegenschein and properties of outer solar corona.

Search for special ultra-violet and X-ray sources; search for shifted Lyman-alpha radiation from distant galaxies; lunar, planetary and cometary studies (atmosphere, surface temperature and possibly topography); study of directional intensity of cosmic rays; study of profiles of interplanetary and interstellar absorption lines.

Infra-red studies of stars and planets; microwave spectroscopy of stellar regions; photography and television of star fields in ultra-violet for study of stellar evolution; high-resolution studies of double star systems.

The second long-term project would be the development of lunar satellites for the following investigations:—

Study of properties of lunar gases—mass number, degree of ionization, temperature, secular and regular variations and possible connection with solar particle flux, meteorite and dust fluxes, possible volcanism.

Study of lunar surface—topographical details, radioactivity, X-ray spectrum, altimetry; measurement of lunar gravitational, electric and magnetic fields; observation of radio and infra-red radiation to obtain temperature depth curve.

Provision of a long-life solar and interplanetary observatory for observations of solar corpuscular flux, interplanetary dust, and cosmic rays outside the terrestrial magnetic field, and taking a first step towards the study of planets.

Organization of Scientific Work ESRO's scientific projects would come under three categories: (1) ESRO's own experiments, (2) combined national/ESRO experiments and (3) purely national experiments with ESRO's assistance. For the first two classes of experiments, ESRO would provide technical facilities such as co-ordination and engineering of rocket payloads; testing of components and payloads; engineering of satellites and of certain experiments; launch vehicles; telemetry, stabilization, recovery, power supply and other equipment; launching ranges, launch operations and data recording and reduction.

Opportunities for original research beyond those existing in individual countries would also be provided by ESRO, by means of two types of research fellowship. Visiting fellowships would be tenable at the research centres of member states, and in addition there would be research fellowships tenable in the research or technical groups of ESRO.

Data Handling It is clearly evident that there would be a requirement for a centre to deal with the large flux of data from ESRO space projects. Such a centre should be situated close to a scientific community, a communication centre and a convenient airport. It should also be relatively close to other computing facilities.

ESRO's tracking and telemetry network should be capable, if need be, of operating independently of existing networks, but capable also of being linked with them where possible. A minimum network could be formed by the creation of four new tracking and telemetry stations, the addition of radio tracking facilities to two existing telemetry stations, and the use of other radio tracking data which may be obtained by stations not formally within the network.

The present US Minitrack stations form a rough line down longitude 75°W, and ESRO (in co-operation with the USA) could create two new chains, one running through Europe and Africa at about 15°E and the other through Japan and Australia at 135°E.

The 135°E chain would use the existing Minitrack stations at Winkfield and Johannesburg, and three new stations at Kiruna, Southern Italy or Spain or the Canaries, and Kano (existing Mercury station) or Fernando Po. Along 15°E the existing Minitrack station at Woomera would be used, with a new station in Japan and an expansion of the telemetry station at Singapore.

In addition to these radio-tracking stations, the establishment of at least three optical-tracking stations is recommended.

Sounding-rocket Ranges As reported last week, the creation of a new range at Kiruna, Sweden, is envisaged for firings in the northern auroral zone. For medium-latitude firings, existing national facilities might be used. Those considered were:—

South Uist Range (UK), 57°N—Not adequately equipped; could only be used for small sounding rockets at marginal costs.

Aberporth Range (UK), 52°N—Adequately equipped but limited in size (roughly circular, 32km radius).

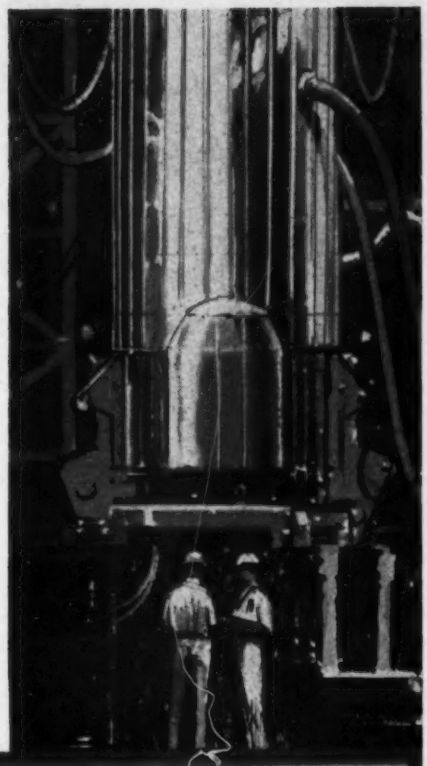
Sardinia Range, 39°N—Adequate in size and probably in instrumentation.

Hammaguir Range (Sahara), 32°N—Adequate.

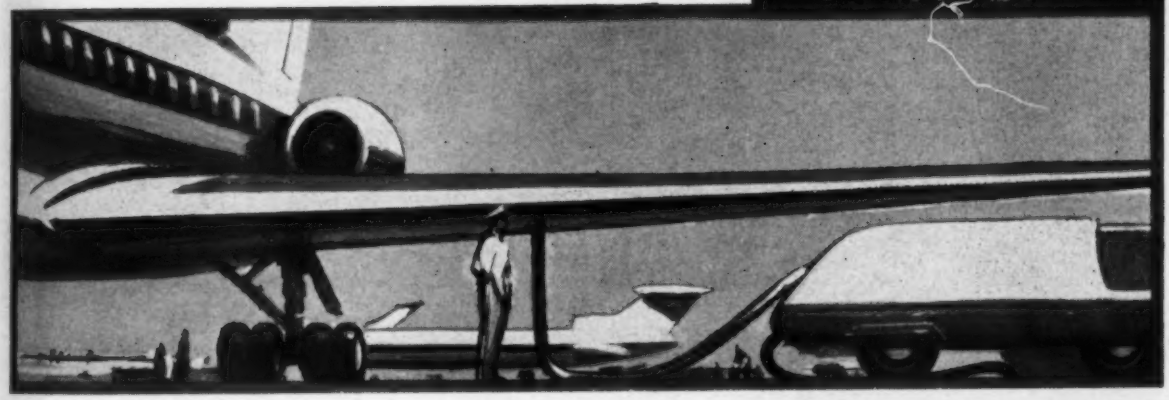
Woomera Range (Australia), 31°S—Adequate.

The gap between 39° and 52°N could be filled by a range at about 46°N, a site in the Landes in France being "an interesting possibility." There appeared to be no precise scientific requirement as far as the lower latitudes were concerned, although the Canary Islands (28°N) and the Fernando Po Island (near the equator) were possibilities for the future. It did appear scientifically desirable to operate in the very high latitudes, and three sites in Greenland—Thule, Godhavn and Nassarssuaq—provided possibilities.

France was developing a self-contained mobile firing unit, due for completion next spring, which might be used for temporary operations in remote places. In this respect firing from the sea would be easier, but was believed to be basically more expensive.



Down go fuelling costs with the new A.W.E. fuel coupling



A new comprehensive range of aircraft mounted coupling units for aviation fuelling is now available ex stocks at A.W.E.

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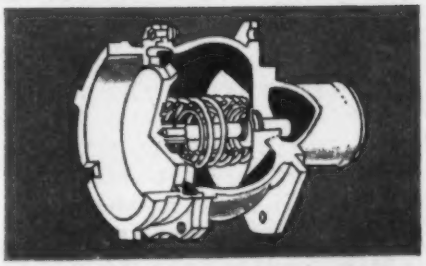
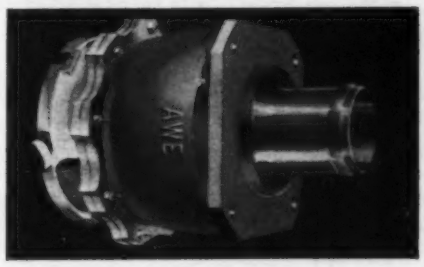
A development of this design for handling H.T.P. is also available, complete with A.W.E. designed hose coupling.





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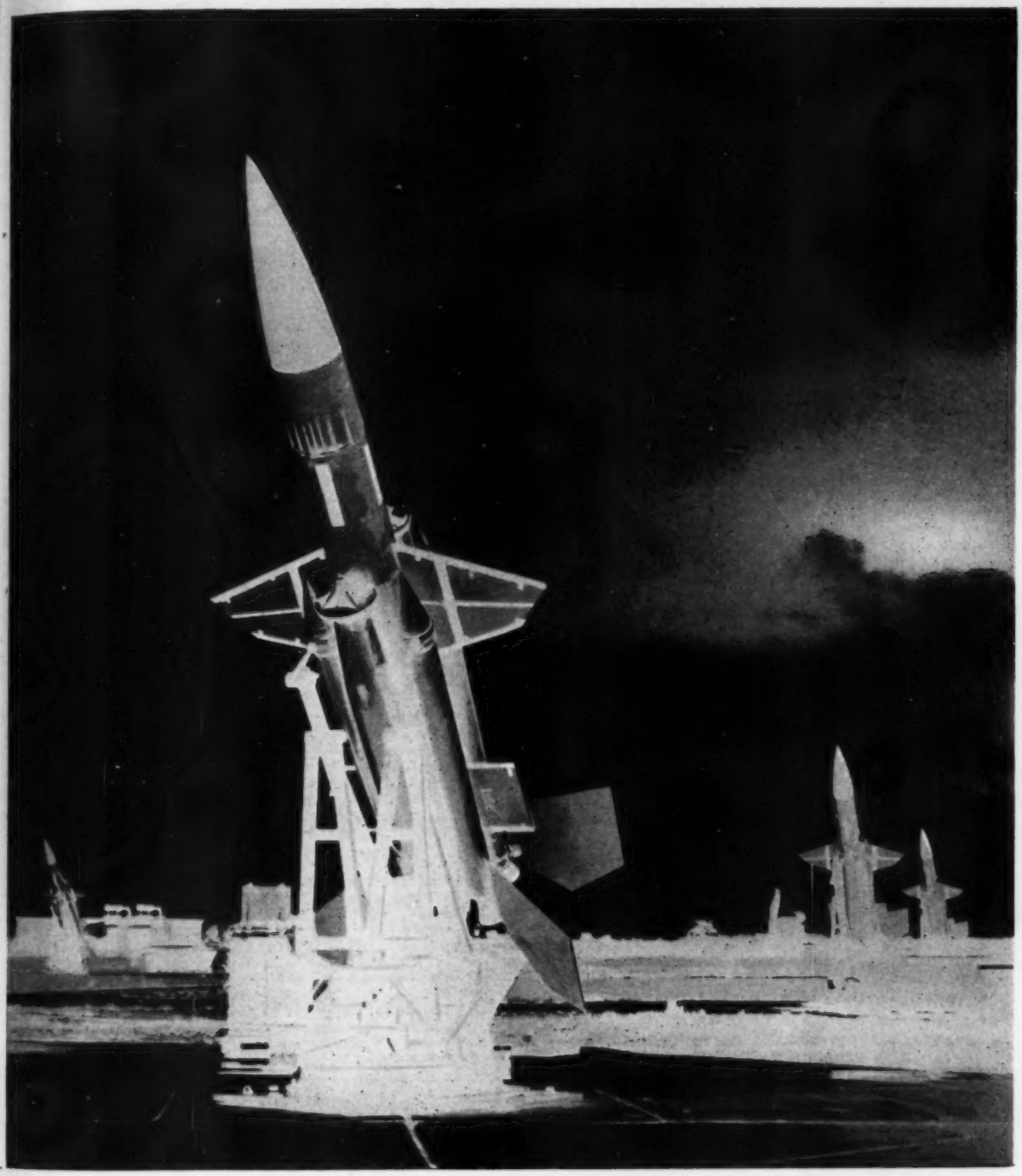

BSW.3

BLOODHOUND MARK II STRENGTHENS SWEDEN'S DEFENCE

Sweden, who chose Bloodhound Mark I for her defence, has now ordered Bloodhound Mark II for her second generation guided missile system—to put Swedish defence ahead of tomorrow's problems.

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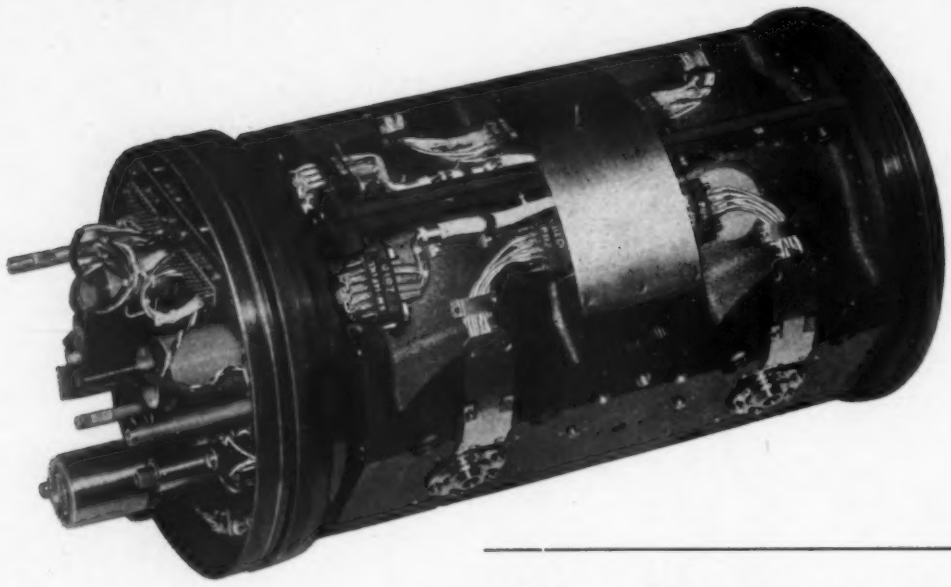

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Missiles and Spaceflight . . .

SATURN PROSPECTS

Cape Canaveral, Florida

FOLLOWING the October 27 flight of a preliminary rocket of the Saturn C-1 configuration from Cape Canaveral (*Flight*, November 2), Dr Wernher von Braun commented on the overall Saturn programme. Despite the highly encouraging results of the first shoot, he said, the programme could not be speeded up markedly in the immediate future. The critical factor would be the availability of upper staging.

Approximately $600m (£215m) has already been spent or appropriated in the Saturn programme, which shares with the Mercury manned spaceflight project and a number of military vehicle systems the highest US materials priority, termed DX. The maiden

By WILLIAM HINES (*Washington Star*)

flight of the Saturn vehicle was of almost unparalleled perfection —only two other US rockets, Titan and Minuteman, were successful on their first launchings.

The shot was hailed in the US as a great step forward in American rocketry, as indeed it was. But many commentators jumped to one of two erroneous conclusions: (a) that the US had now answered the Russians in the big-booster end of the space contest, or (b) that the success of Saturn C-1 was a significant contribution to achievement of the national goal of a team of men to the Moon and back before 1970.

Actually, the Saturn C-1 is a full two years away from orbital flight and probably three years away from the sort of reliability that would warrant entrusting men to it. Thus, though the vehicle's first stage is believed to exceed Russian boost power by a factor of almost 2, the lack of orbital capability negates Saturn's present role as a challenger to the Soviet rockets.

As far as men on the Moon are concerned, the first configuration of Saturn does not fit into this part of the space programme. An advanced model of the Saturn rocket, using an entirely different propulsion system, will be needed for the Moon journey. Similarity between Configuration 1 and later configurations is in name only.

A decision on the type of rocket to be built for the manned lunar voyage, promised "before Christmas" by Dr von Braun, will probably be made within a fortnight. It now appears most improbable that the US will attempt to build a huge Nova cluster of eight 1.5-megapound engines. This type of machine, 45ft in diameter at the base, more than 300ft high and weighing something over 4,500 tons, would be necessary for a direct flight to the Moon.

Designers have come to the conclusion that engineering problems with such a large rocket would present greater difficulty than would orbital rendezvous. It is now almost a foregone conclusion that the Moon journey will be done in two jumps instead of one, the first jump taking payloads to a 300-mile orbit for assembly, and the second taking them on to the Moon.

Three advanced Saturn configurations, C-3, C-4 and C-5 are being studied preparatory to the final decision. C-3, powered by two 1.5-megapound F-1 engines, could place 100,000lb in orbit, and a rendezvous of four payloads would be necessary. C-4, with four F-1 engines, could orbit 200,000lb, thus permitting assembly of the required 400,000lb payload with a single rendezvous. C-5, powered by a five-engine F-1 cluster, could orbit between 250,000 and 300,000lb. A single rendezvous would still be needed with C-5, but an advantage to the use of this vehicle is that its added payload capability could be translated into a safety-margin at liftoff.

The C-4 concept is being advocated by General Dynamics/Astronautics, builders of the Atlas and Atlas-Centaur systems. C-5 is favoured by some members of von Braun's group, principally for the safety factor it offers.

COMPLEX 34

SATURN was launched from a 45-acre site at Cape Canaveral known as Complex 34, constructed for NASA by the Army Corps of Engineers. At the centre of the 438ft diameter concrete launch pad is a 27ft high pedestal on which the Saturn vehicle is mounted. In its initial configuration the rocket is 162ft high, and is overshadowed by the huge servicing structure shown in the accompanying photograph. Described, inevitably, as the free world's largest movable wheeled structure, this tower is 310ft high, weighs 2,800 tons, and has a 56ft wide central opening.

After the rocket checkout is complete, the service structure is moved to a parking area some 600ft from the launch pedestal. Movement of the structure, at a rate of 1.5-40ft/min, can be controlled by one man in a control cab at the 27ft level. The two base legs of the structure, each measuring 70ft × 37ft at the ground, each contain a two-storey building which houses the tower's operating equipment and rocket checkout apparatus.

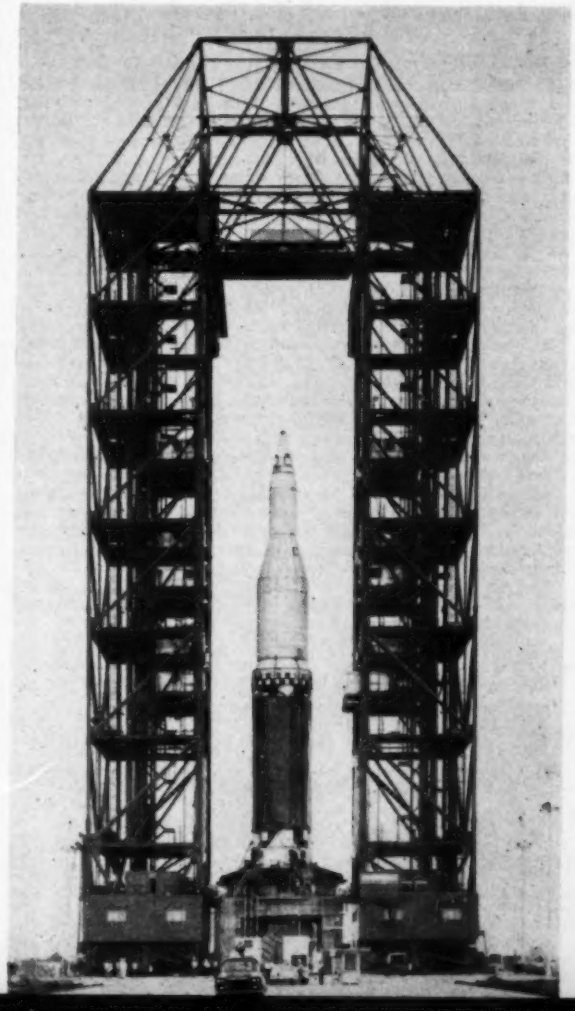
The launch control centre, similar to the blockhouses previously built at the Cape for Atlas and Titan missiles, has 12ft-thick concrete walls; a 2ft-thick, 23 ton door; and 10,000 sq ft of protected floor-space on two levels. Beneath the launch pad is a 215ft × 38ft room known as the automatic ground control station, which serves as a distribution point for all measuring and checkout equipment, power supplies and high-pressure gas.

Kerosine fuel for the booster is stored in two 30,000 gal above-ground tanks located about 950ft from the launch pedestal. The fuelling operation is completely automatic and is operated from the blockhouse, the full sequence taking approximately 40min.

Well separated from the fuel supply, at a distance of some 650ft from the pedestal, are two liquid oxygen storage tanks. Time to fill Saturn's five lox tanks is estimated at about 40min.

There are several uses for gaseous nitrogen and helium in the preparation and firing of Saturn, and a high-pressure gas facility is located about 1,000ft from the launch pad. This contains 32 storage vessels for nitrogen and four for helium.

About one mile north of Complex 34 is the site of NASA's planned Complex 37. Scheduled for first-phase completion late in 1962, this new complex will eventually have two launch pads served by a common rail-mounted tower. Further expansion is planned with the acquisition of an additional area of some 80,000 acres, which will permit the construction and operation of six or more large Saturn and Nova-class vehicle complexes.



Saturn's 310ft service structure on Complex 34 at Cape Canaveral is here seen together with the launch pedestal on which the vehicle itself is mounted. Weight of the service structure is 2,800 tons

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. The names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Monospar Memories

AS one of the few owner-pilots of Monospar aeroplanes, I was naturally very interested to read the article in your issue of October 12, entitled "Vintage Twin." I would point out, however, that your contributor "H. W." was incorrect in stating that these machines were made in Croydon. The factory of the General Aircraft Company was in fact at Hanworth, which was the headquarters of National Flying Services. These aircraft were designed to take Pobjoy engines, by a Mr Stieger, and he also designed a retractable undercarriage for my machine, which was fitted with brakes. It was possible to start the engines when sitting in the left-hand seat in the cockpit.

Your contributor was rather critical of the flying quality of the particular machine that he tested; this I can only think was due to the fact that it had been fitted with Gipsy engines, which in my opinion also detract from the general appearance of the aircraft. As I was then living in Ireland I decided to order a twin-engined machine to replace my Puss Moth, as I was not very happy about crossing 50 miles of open sea on a single-engined machine. On referring to my log-book I find that I went to Hanworth on June 12, 1933, to take delivery of this new aircraft, which was an ST.4 model registered G-ACHU. The log-book shows that I flew it for 20min with H. M. Schofield, and made three landings. I then flew it to Heston Aerodrome, and the following day I brought it home to Co Wexford. My landing field there was barely 400yd long, and it would therefore appear that this machine was not in any way difficult to fly or manœuvre.

New Ross, Co Wexford ROBIN CAZALET

[Designed by H. J. Steiger, the first Monospar was built at Brockworth by the Gloster Aircraft Co Ltd. Further aircraft were built by the Monospar Co Ltd, but in 1933-34 the company was reorganized as General Aircraft Ltd and moved its works to the London Air Park, Hanworth, near Feltham, Middx. It is probable that during the changeover period operations were conducted at both Hanworth and Croydon. The aircraft flown by "H. W." carried an instrument-panel notice which stated "Designed and manufactured by General Aircraft Ltd, London Airport, Croydon."—Ed.]

BEA's Pionairs

HAVING much enjoyed reading Mr John M. Davis's letter (September 21), may I add some further data, plus some other odd personal reflections on the unsurpassed reputation of BEA's former DC-3/Pionair fleet? Before doing so, it is as well to remember that although all 38 Pionairs have now been sold, BEA are still continuing to operate their remaining faithful seven Pionair-Leopards, mainly on the Scottish Highlands schedules. They include G-ALXN, which was one of the two Pionairs (the other being G-AMDB) which, back in 1950, were converted by Field Aircraft Services to take Rolls-Royce Dart 505s, and were commonly known as the two Dart-Dakotas. Eventually both aeroplanes were returned to Scottish Aviation, who "de-modified" them back to Pionair standards. Appropriately enough, G-ALXN still bears the distinguished name *Sir Henry Royce*.

In some fifteen years' service with BEA—and recalling that the original fleet numbered only 22 C-47 Dakota 4s when the Corporation started operations on August 1, 1946—it has been estimated that the Pionairs have carried over nine million passengers. Up to December 1960, the whole Pionair fleet had logged about 100m miles, during which time only three fatal accidents were recorded: in two of these, passengers and crews were involved, whilst in the third no passengers were involved, since the aircraft was on a scheduled all-cargo flight. Surely this must rank as an extremely fine record for one particular type of aeroplane, with no fewer than 45 of the type owned by the same operator. I doubt if such an excellent record could be bettered by any other operator using such a large fleet of one type.

The outstanding success and unique achievements of BEA's much loved and much respected DC-3 Pionairs are a classic example of tremendous all-round teamwork spirit in which board members, senior and junior executives and the engineering, operations, sales and traffic departments have all played their respective parts. In doing so, each team has contributed to the great success of what was originally known, in 1950, as the DC-3/Pionair Project.

I should like to mention especially Mr Peter Masefield, Mr Beverley S. Shenstone, Capt J. W. G. James and the late Mr D. F. McIntyre (former managing director of Scottish Aviation Ltd), without whose resourcefulness and teamwork there would probably never have been BEA's Pionair DC-3 conversions.

Having myself resided at Prestwick for some four years (1948-52), and although not in any way connected with BEA or Scottish Aviation at the time, it was, nevertheless, my good fortune to visit the company's factory on several occasions, during which I was able to see these Pionair conversions taking shape—an impressive sight which I shall always vividly recall.

Enclosed is a photograph [printed below—Ed] showing G-AGKF, one of BOAC's former big fleet of C-47 Dakota 4s. I took it in 1947 whilst stationed at Khartoum, just before flying to Cairo in the same aircraft. G-AGKF disappeared from the UK Register *circa* 1949 and I never have been able to find out what happened to it. I rather suspect it may have been ferried back to the USA during the Korean War.

Nairobi, Kenya DENNIS M. POWELL

In writing about BEA Pionairs Mr Dennis Powell also mentions this BOAC member of the DC-3 family, in service some 12 years ago

Bomber Command v Germany

NOW that the controversy initiated by Messrs Webster's and Frankland's new book belittling the aims of Bomber Command's wartime attacks is dying away, it would seem to be time to summarize the arguments put forward by the defence.

It is a psychological fact that if one sets out with certain preconceived ideas on a subject one subconsciously accepts evidence supporting those ideas, while rejecting that tending to disprove them. Both the authors held the view that the bomber offensive was ineffective, and it is therefore natural that the statistics given as evidence should be those proving their point. The authors' viewpoint is also reflected in their writing: for example, "... only 15 per cent of the aircraft bombed within 75 square miles of their target..." sounds far more discreditable than "... 15 per cent of the aircraft bombed within five miles of the target ...," which amounts to the same thing.

Historians in general have a tendency to be wise after the event—indeed, this is to some extent their job. They do, however, seem to forget that all the relevant facts which they have ascertained were probably not known to those concerned at the time Thus, while it is obvious now that had a certain course been followed it would have been far more effective than what was in fact done, any commander can only act on the facts available to him at the time. If all field commanders had second sight and complete information, wars could be won with few casualties and no defeats. On several occasions targets allegedly vital to Germany's war effort were attacked and destroyed with no apparent effect, because they were not as vital as was thought.

The main criticism appears to be that the general destruction of selected German cities was not worth the effort expended, and that it would have been more profitable to have made precision attacks on small, selected targets. It is also alleged that Bomber Command was defeated during these attacks, the loss of 94 aircraft against Nuremberg being quoted as evidence. There are several arguments which can be raised against these allegations:—

(a) The statistics showing that production increased during these attacks are given as evidence of wasted effort; but is this a justifiable conclusion? Surely the crucial question is by how much would production have increased had these attacks not taken place? This is admittedly almost impossible to answer, but a man who has had a nerve-shattering, sleepless night is not the most efficient worker next morning, even assuming that his factory is undamaged. Secondly, there can be a great difference between paper production-figures and actual production, particularly in a totalitarian state, where failure to meet the scheduled output might have dire results on the personnel concerned. The fact that many German field commanders complained so bitterly about shortages of equipment and material surely indicates that actual production was far behind that scheduled, and it is not unreasonable to suppose that this was due, in part at least, to Bomber Command's attacks.

(b) In total war, the object is to hit the enemy where it hurts most, and it is easier to replace tools, equipment, and even whole factories, than skilled labour. By area-bombing whole cities, of which perhaps 80 per cent of the population were engaged in the war effort, the casualties must, by the law of averages, result in a considerable reduction of the skilled labour force available, and thus have an effect on production, even assuming that no factories or other facilities are damaged.

A Lockheed L.749A used by the French for search-and-rescue duties (see letter below)

(c) The defences against bombing attacks represented a considerable proportion of Germany's war effort, which could otherwise have been used for offensive purposes. One obvious example is the Ju88 night fighters, which could, with little alteration, have been used as either bombers or long-range fighters against Coastal Command's anti-submarine patrols in the Bay of Biscay. By bombing whole towns with large forces a greater defensive effort (and a greater dispersion of that effort) was required than if only "military" targets had been attacked by smaller forces.
(d) It must be borne in mind that there were few units with a sufficiently high standard of training to be able to carry out precision attacks on small targets, and therefore the principle of area bombing was making the best use of the available forces. It is pointed out that when such a force became available, it was used to the full (e.g., Augsburg, Le Creusot, the dams, the Antheor Viaduct, the Dortmund-Ems Canal, and the "Crossbow" sites). It must not be overlooked that this type of attack would have been almost impossible without the experience gained during more general attacks.
(e) The allegation of "defeat" depends upon the meaning placed upon the word. If the fact that a specific task—namely, the destruction of 62 German cities—was left uncompleted, owing to the demands of what might be broadly termed tactical bombing in support of the invasion, constitutes defeat, then Bomber Command was defeated. The loss of 94 aircraft against Nuremberg was perhaps a tactical defeat, although the attack was still pressed home, but this was just one single incident. As the C-in-C says, if you fight a battle every night, you must expect an occasional defeat.

The stark fact remains that there was, in effect, no other method of offence open to this country between 1940 and 1944, certainly not one offering casualty rates as low as 4 to 5 per cent per operation (Commando raid casualties were up to 70 per cent). The authors imply that day bombing might have been more effective; but apart from the lack of suitable bombers and long-range fighters, even the US Eighth Air Force, which developed the technique to a fine art, suffered a casualty rate of far more than 5 per cent, while the weight of bombs dropped compared to the effort involved was far less. In addition, the morale and physical effect (due to lack of sleep) of round-the-clock bombing was surely far greater than that of either day or night bombing alone, while the loss of production time when the attacks were in progress was also considerably greater.

One aspect of Bomber Command's efforts which has never received the credit it deserves was the perpetual "Gardening," or mine-laying operations. Perhaps the reason is that their results are so difficult to assess, but there is no doubt that they did cause considerable losses among German shipping, with comparatively low casualties among the aircraft. In passing, it may be remarked that the only damage to the three German warships which escaped up the Channel from Brest was sustained by the *Prinz Eugen*, which struck a mine laid by Bomber Command.

Like all other historians to date, the authors do not appear to have appreciated the full significance of the Peenemunde attack. While this was not a complete success, Maj-Gen Dornberger, who commanded Peenemunde, admits that the introduction of the V-weapons was delayed by some six months, and Gen Eisenhower is quoted as saying that, had those weapons been introduced on the scale planned, but six months earlier, D-day would have been impossible. (One reason that neither the V1 nor V2 were ever used on the scale planned was "Operation Crossbow.") On that basis, therefore, it is not unreasonable to say that the attack on Peenemunde had a greater effect on the duration of the war than did any other single operation, and that "Crossbow" was a very effective follow-up.

The foregoing points, with few exceptions, are merely summaries of the arguments put forward in the national Press by people ranging from Marshal of the Royal Air Force Sir Arthur T. Harris downwards, most of whom were concerned in one way or another with Bomber Command. Taken together, they surely represent something far nearer the truth than the views expressed in the book.

Stevenage, Herts — S. REW

Search-and-Rescue L.749As

I HAVE pleasure in sending you a photograph [reproduced on this page—Ed] I have taken at Perpignan showing an L.749A of SAR (Search and Rescue—Section Aérienne de Recherches, in French).

This aircraft, F-BAZT, is one of six owned by the Secretariat General à l'Aviation Civile et Commerciale and utilized by SAR with military crews. All the planes are modified for rescue and are fitted with four blisters (two on each side of the fuselage) for direct observation. Fifteen men form the crew of each.

An aircraft like this one, registered F-BAZP, discovered the wreckage of the ill-fated Derby Airways DC-3 G-AMSW on Monte Canigou.

All the six L.749As are ex-Air France machines and are registered F-BAZJ, F-BAZM, F-BAZO, F-BAZP, F-BAZT, F-BAZY. Colour scheme is white top, orange Day-glo cheat line along the fuselage and grey below this orange line. Tail is orange and grey.

Perpignan — R. CARATINI

Airmail Pioneers

OUR group at 30 Air Materiel Base, RCAF Langar, Notts, is attempting to obtain data on certain aviators from Great Britain who participated in some way in the development of airmail services in Canada.

A copy of a letter addressed to the Royal Aero Club and listing seven aviators from Great Britain is enclosed. Would it be possible for you to publish this in the hope that some readers may have data on these men?

RCAF Langar, Notts — R. K. MALOTT, Flt Lt
President, Stamp Club, 30 Air Materiel Base

[*The substance of Flt Lt Malott's letter to Col R. L. Preston, RAeC Secretary-General, was as follows*—Ed]

"I wrote to your organization last October 1960 in an effort to obtain a lead on certain aviators from Great Britain who assisted in various aspects in the development of airmail services in Canada. Of the fifteen names listed I have been able, within the year, to locate all but four.

"I submit these names, plus others, for your perusal again. If anyone could provide me with a lead for contacting these men, or their next of kin, I would be most thankful.

"The names of the four personnel from the first list are:—

"(a) Idris Glyn-Roberts. He flew for Commercial Airways Ltd, from Edmonton, Alberta, in 1928-29. He returned to England in 1930 and operated his own commercial airline. He was killed in an air crash in Egypt in 1938. The Air Ministry can provide no leads.

"(b) Arthur Fergus Ingram (born 1892 in England). He was general manager of Canadian Airways Ltd, from 1928 to 1932. He returned to England in 1931.

"(c) Major G. H. Scott, CBE, AFC, killed in the crash of R.101 in 1932. The last known address of his next of kin was Chota Castle, Chew Magna, Som.

"(d) Lt Harold Charles Warren Livesey-Warble. He flew for Canadian Airways and returned to England at an unknown date.

"Names of the three new personnel are:

"(a) Fg Off C. W. Gudemore, MC, PFC. He flew in the RFC in World War One and then went to Canada for a while. He was one of the first to fly across Canada from Halifax to Vancouver in 1920.

"(b) S. G. Long. He flew in the RAF in World War One and later for Imperial Airways. He apparently was killed during World War Two.

"(c) C. G. 'Boom' Lumsden. He flew for Commercial Airways and then returned to England sometime during the 1930s."

FORTHCOMING EVENTS

Nov 9 — Radar and Electronics Association: "Space Communications" (Part 2), "Orbits and Their Economics," by W. F. Hilton.
Nov 10 — British Interplanetary Society: "Photography from Rockets and Satellites," by R. Hall.
Nov 14 — RAeS Astronautics and Guided Flight Section: "A Comparison of the Control Problems of Missiles and Aircraft," by K. W. Smith.
Nov 15 — Royal United Service Institution: "Amphibious Warfare in the Late 1960s: Seaborne/Airborne Operations," by Maj-Gen J. L. Moulton.
Nov 16 — RAeS: Seventeenth British Commonwealth Lecture, "The Progress of BEA and of European Air Transport 1946-61," by Lord Douglas of Kirtleside.
Nov 17 — RAeS Man-powered Aircraft Group: "Aerodynamics of Man-powered Aircraft," by T. R. F. Nonweiler.
Nov 17 — Institute of Navigation: "The Navigation and Guidance of Supersonic Aircraft," by Capt William L. Polhemus.
Nov 21 — RAeS: "Military Ground Effect Vehicles," by W. H. Coulthard.
Nov 22 — RAeS Graduates' and Students' Section: "Army Aviation," by Col C. D. S. Kennedy.
Nov 22 — British Interplanetary Society: Symposium on "Materials for Space Technology."
Nov 23 — RAeS: "Flight Characteristics of the B-58," by B. A. Erickson.
Nov 24 — RAeS Graduates' and Students' Section: Winter Dance.
Nov 27 — RAeS Historical Group: "The Society's Library and Aeronautical History," by F. H. Smith.
Nov 28 — Institute of Transport (West Middlesex Group): "A Pilot's View of Air Transport," by Capt O. P. Jones.
Nov 29 — Society of Environmental Engineers: "The Response of Dynamic Systems to Shock Excitation," by B. H. Venning.

RAeS Branch Fixtures (to Nov 16): Nov 11, *Glasgow*, Symposium. Nov 14, *Luton*, "Modern Ship Design," by J. Burton Davis. Nov 15, *Christchurch*, "Rebuilding and Flying Historic Aircraft," by Air Cdre A. H. Wheeler; *Glasgow* (Graduates' and Students' Section), "Developments intended for Prestwick Airport," by C. D. Waldron.

Above, a Viscount shadow leaves the Bahamas en route for Miami, source of US tourists; centre, one of the airline's two Viscount 702s at Nassau; below right, the other Viscount at the same airport at sunset, with one of the airline's five DC-3s

TO lose £400,000 on revenues of £800,000, as Bahamas Airways did last year, requires something of a financial miracle, as we remarked in our issue of August 3. How it happened, and why BOAC—having sold an 80 per cent interest in the airline to private enterprise in 1959—had to mount an expensive rescue operation has never been fully recorded.

It is a story which arouses, as we discovered during a recent visit to the Bahamas, some interesting conversation. So far, astonishingly enough, it has not aroused the interest of MPs. Mr Frank Beswick, in his recent *Flight* interview with Mr Keith Granville, chairman of BOAC Associated Companies, referred to "the extraordinary circumstances" in which BOAC's previous interest in Bahamas Airways was bought out by private enterprise and sold back again. He asked in so many words how much money Messrs Eric Rylands and David Brown, the parties concerned, had gained or lost in the transaction. Mr Granville said he was unable to give the figures, and that a full report was now with the Minister.

According to four sources of information in the Bahamas, Mr Rylands himself did not have a great deal invested in Bahamas Airways, most of the money having been put up, and lost, by Mr David Brown. But according to a spokesman for Mr David Brown, this is not correct. Equal shares in Skyways Bahamas Ltd, the holding company, were held by Mr Rylands and by Mr Brown, who was the chairman. Mr Brown had not, the spokesman said, yet lost any money, although certain matters were still outstanding. It has not been possible to confirm whether Mr Rylands lost any money, and whether BOAC took responsibility for all the losses.

Two Skyways Hermes, G-ALDE and G-ALDL (their interiors restyled at a cost of £15,000 by Mr Rylands' company), were chartered to Bahamas Airways at a rate believed to have been some £200 per hour. A third Hermes, G-ALDT, was later transferred to Bahamas Airways to replace one that had been damaged. Two DC-3s refurbished in the UK by Samlesbury Engineering, one of Mr Rylands' companies (recently renamed Skyways Engineering Ltd) were sold to Bahamas Airways in 1959 for some £35,000 each.

When BOAC went to the rescue of Bahamas Airways in December 1960 the corporation took responsibility for losses amounting to some £400,000. One reason given by BOAC for its decision to repossess the airline was the need to protect its traffic rights; another reason appears to have been the possibility of a take-over by Cunard Eagle.

ILLUSTRATED WITH "FLIGHT" PICTURES

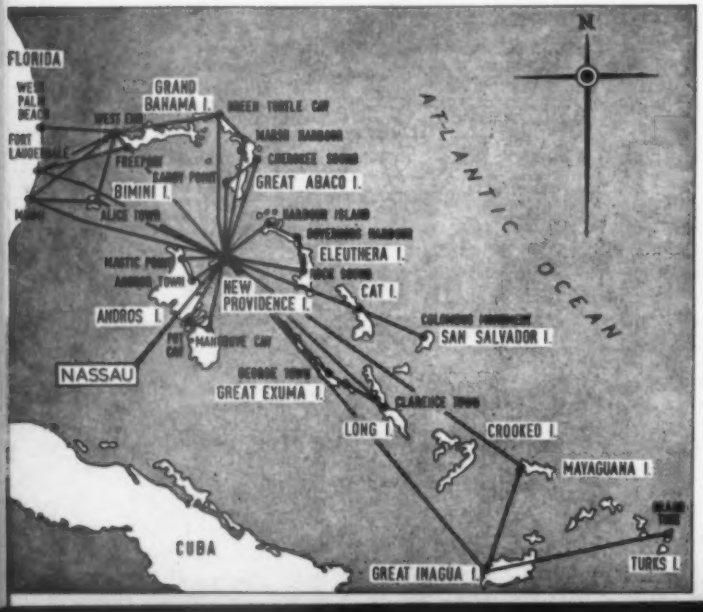
When Mr Rylands was first investigating the prospects of going into Bahamas Airways, he was offered a good deal of advice by local people on how to breathe new life into an airline that had been poorly managed for many years. He was told that it would be a mistake to make friends with Pan American, carrier of 60 per cent of the traffic on the Miami-Bahamas route. While obviously no airline was ever harmed by being friendly with Pan American, it does seem curious—and it certainly proved mistaken—that Pan American were made general sales agents for Bahamas Airways.

BAHAMAS AIRWAYS

Report on a Visit to Nassau

The use of Hermes on the route also proved to be an unfortunate commercial decision. These aircraft were unknown in western hemisphere markets and proved difficult to sell to Americans. They could not compete in passenger appeal with the Viscounts operated by Cunard Eagle, and many services were operated nearly empty. An unfortunate accident to VP-BBP on October 16, 1960, involving the loss of a propeller on take-off at Nassau, effectively gave the Hermes the commercial *coup de grâce*. It was a great boost to Bahamas Airways' traffic and morale when, under BOAC's management, two Viscounts were introduced in July this year. Even if the Hermes had been a popular type, and there had been no Cunard Eagle Viscounts to compete with, it is probable that the Hermes could not have made money on the route; it was never designed for short-haul shuttle services.

Mr Rylands was also expected to make some changes in the airline's management. No changes were, however, made; while this says much for Mr Rylands' care for human relations, it does suggest another reason for the airline's decline.



It is known that Mr Rylands was disappointed that local finance, which he had been encouraged by the "Bay Street boys" in Nassau to think would be forthcoming, did not in fact materialize. However, he did press for a doubling of the Bahamas Government grant for the operation of the inter-island services, from about £15,000 to about £30,000. He is also known to have said that, had he been aware of the fact that another Bahamas carrier (Eagle) was going to be licensed by Bahamas Government to operate to Miami in competition with Bahamas Airways, he might have had second thoughts about his participation in the airline. This is substantiated by the chronological sequence of events. Mr Rylands' interest in Bahamas Airways became effective in April 1959—after Eagle had applied for a Nassau - Miami licence, but before it was granted.

So much for past history, though it is to be hoped that Parliament will seek from the Minister full information about the circumstances in which Bahamas Airways was bought from BOAC and sold back again. For how much did BOAC sell its interest in Bahamas Airways? And for how much did BOAC buy it back? As Frank Beswick has remarked, the Colonial Office would have had great difficulty in persuading Parliament to grant for Colonial development the amount of money that has been put into Bahamas Airways over the past ten years. Is there any reason why the public should not have the figures? Public accountability can scarcely be satisfied with such sparse information.

What about the future? Air Cdre G. J. Powell took over as chairman and managing director with effect from March 1, 1961. Since July 15 the airline's five DC-3s have been operating domestic services—i.e., the inter-island routes—in the black. Of course, the airline receives a subsidy of some £30,000 a year for domestic services; this expires next May, when the House of Assembly has to give its approval (which is by no means routine) to its continuation. We asked Air Cdre Powell whether Bahamas Airways' domestic routes are inherently unprofitable, and whether they could ever be operated without a Bahamas Government subsidy. He replied: "I think it likely that we shall attempt to go forward without a subsidy if the correct terms can be found." We formed the impression that Air Cdre Powell has proved to his own satisfaction that, with certain economies, domestic services can be made to pay their way.

Approaching the threshold of the main runway at Nassau. (This picture, and that opposite, were taken from a Cunard Eagle Airways Viscount)

AIRWAYS REVITALIZED

BY THE AIR TRANSPORT EDITOR

Although he did not say so in as many words, it is probable that Bahamas Airways *can* operate its domestic routes without subsidy, provided it is not under pressure to operate to places which (in the words of one Bahamas Airways official) are "obvious lemons." Such places, in fact, are most of those to which amphibious services are operated by Gooses. Significantly, Air Cdre Powell told us of his intention to reduce the fleet of three Gooses to one.

Socially desirable though the outer-island services are, the more you fly a Goose the more you lose. Bahamas Airways believes that its domestic services *can* be made to pay, and it will be sure of it when it has got rid of its Gooses. One of the problems, of course, is the building of airstrips on the outer islands. Plans and actual work are in progress; and wherever strips have been built traffic has increased. At one place, for example, where the amphibians had previously flown in 16 passengers in a month, DC-3s landed 196 in a comparable period. This gives a measure to the increased business which airstrips generate.

Bahamas Airways has five DC-3s and these will sooner or later have to be replaced. We asked Air Cdre Powell about this and he replied that the replacement would probably be the F.27. When we expressed surprise that a BOAC associate might purchase foreign aircraft in preference to Avro 748s or Heralds, Air Cdre Powell agreed that there might be little to choose among the three aircraft from a technical point of view, but that he had to operate aircraft which were acceptable to discerning American travel agents. Would American passengers, we asked, really know the difference between one type and another? The answer was that the majority of the business came from travel agents, who sold the aircraft that they knew, and the F.27 was indeed well known in the USA. Bahamas Airways had learned this lesson with the Hermes.

We asked Air Cdre Powell to comment on suggestions that Bahamas Airways should withdraw from the international routes to Florida and concentrate on its domestic inter-island routes. He dismissed these suggestions. "As traffic to the little islands builds up," he said, "they all want direct services to the source of the traffic

(*Concluded on page 745*)

Straight and Level

HERE is another first for British aviation. In 1170 that celebrated English inventor Henry II suffered severe buffeting from Thomas à Becket. Henry's clear grasp of the buffeting problem is illustrated by the remark he made at the time: "*Are there none of the cowards eating my bread who will rid me of this turbulent priest?*"

Royal ingenuity triumphed, and the said Becket was laminarized (i.e., laid flat) by the now classic method of multiple perforation of the skin.

This was over 700 years before Prandtl and all that jazz. Should I tell the *Daily Express?*

● Congratulations to the Flight Safety Committee for their new and enlarged edition of *Focus*, the journal which disseminates information about air safety. It is an excellent step in the right direction, but it is only a first step. Circulation is private and limited to "people in a position to take action in the field of aviation safety." And although there is no identification of the parties concerned in the incidents and accidents described, the technical Press is limited in the extent to which it is allowed to give wider currency to the contents of *Focus*.

I would like to see this journal given much wider, and more open, circulation. I do not think that the Press would fail to exercise the discretion that is needed in dealing with air safety; if it does so, then the experiment to get *Focus* into the hands of as many people as possible will have failed. But I think the experiment is at least worth a try.

● One of the best things about the Historical Group of the Royal Aeronautical Society is that its members get some fun out of doing a real job for posterity. The sorting of facts from legend or fiction is a fascinating process —to which, I hope, Sir Frederick Handley Page's recent talk, "The Birth of the First Big Aeroplane" (page 722) will be conscientiously subjected. Because the H.P. tradition needs no legend to sustain it; and the prevalent notion (supported by Sir Frederick's title) is, I submit, legend.

I believe that the first big aeroplanes in the world were made by Igor Sikorsky in Russia. The first was built in 1913 and had a wing span of 92ft. A developed type, flown in 1914, had a span of 102ft. The first big Handley Page aeroplane was the O/100, first flown in December 1915. It had a span of 100ft.

● On opening a copy of the *Weekly Clanger*, the new British news weekly, I was surprised to see a photo of Mr Fred Knocking, chairman and managing director of Mammoth Intercontinental Airlines. This was evidently a slip-up, because the accompanying article, under the heading "Air Chief Blasts Industry," was all about Sir Charles Boost. It read:

"Tall, balding Sir Charles Boost (6ft 4in; 190lb max gross), lean as a whippet after years of eating above the clouds in jets, slumped into his deep leather armchair at Britain's staid oak-panelled Air Power Club. (Air Power men all lowered their newspapers; they invariably listen when Sir Charles is talking.)

"Just back from Paris, Fra, France's teeming (pop. 8m) capital city, home of the Eiffel Tower, the Louvre, the Folies Bergère, Brigitte Bardot, and other tourist attractions, Britain's prince of air supremacy had a revealing story to tell.

" 'I've been shopping for jets,' boomed bluff, empurpled jet chief Boost, in a voice that set the chandeliers a-tinkling. 'I wanted at least 40 de Havilland Britannias from the Westland group and 50 turboprop One-Elevens from Hawker-Siddeley (you know, the Handley Page/Beagle/de Havilland/Vickers/Folland/Scruggs consortium). But would anybody listen to me? Did anybody's bosses start unrolling the red carpet for me? No, they didn't. Gad, sir, it's a scandal! I'm going to emigrate from London, Eng, to London, Ontario, and operate Douglas 707s or Boeing VC10s.' "

● Letter to this column about my piece on Qantas V-jets:—

"You are up a gum tree about the V. It is not a capital V, but a boomerang symbol. Hence the logical title for this aircraft is the "Boeing Boomerang." A check of the wing plan form will confirm this theory.

"As for Jet Era 2, I expect you will receive cartloads of cards of irate comments from the comrades—remember the Tu-104?—Yours, etc."

● British United has set a fine example in publishing an annual report. Sparse though the information is—a mere fraction of the amount published by the corporations, and a slightly larger fraction of that published by other airlines—it is infinitely more than is published by any other independent.

Perhaps other independents will follow suit. I hope so, because operators who hide the financial facts about themselves are not really justified in appearing before the Air Transport Licensing Board as equals of operators who do reveal their financial position.

At present the Board is spending hours and hours checking the financial resources of applicants for licences. They would spare themselves much effort if, as in America, every airline were required to publish the facts and figures about itself.

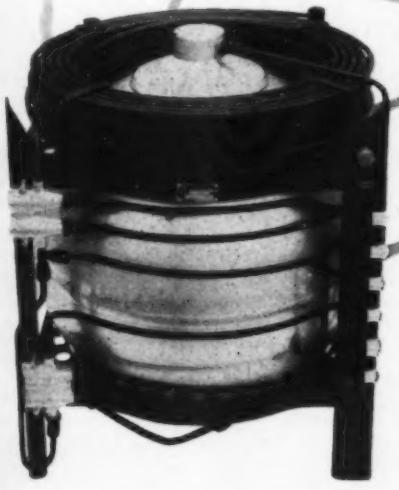
● Now I know why BOAC have opened a service to Manila. The publicity boys discovered a town in the Philippines called Boac.

I have had a look through my *Times* Atlas of the World index, but I can find no places called Cunard Eagle or British United. So this is one route that the corporation will have to itself. Seriously, good luck to BOAC's new Manila services.

ROGER BACON

I consider it proper that a responsible column such as "Straight and Level" should direct the attention of its readers to crafty reflections of the craft of public relations. I cite the adjoining picture, wherein the words "Pan American," on the Boeing 707 so fortuitously positioned in the background, are auto-suggestive of "clipper." In fact, I am able to reveal, the ship is H.M.S. "Victory."

FOR THE VICKERS VC.10....



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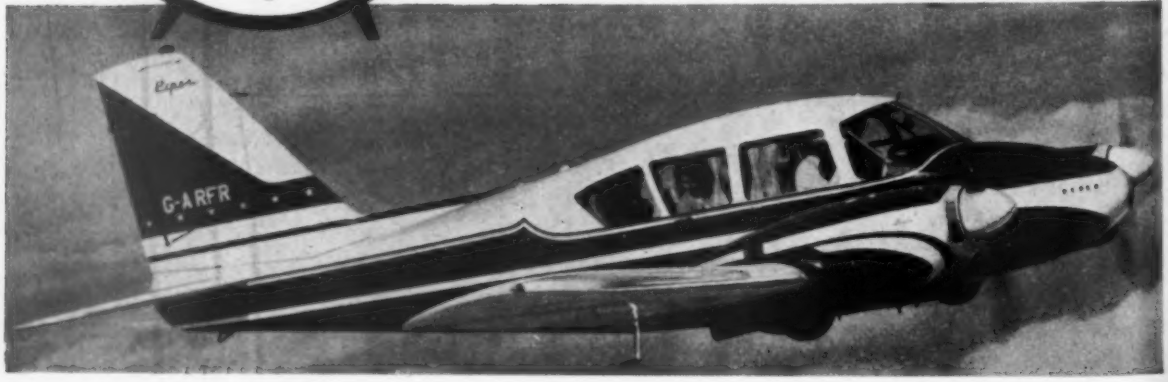
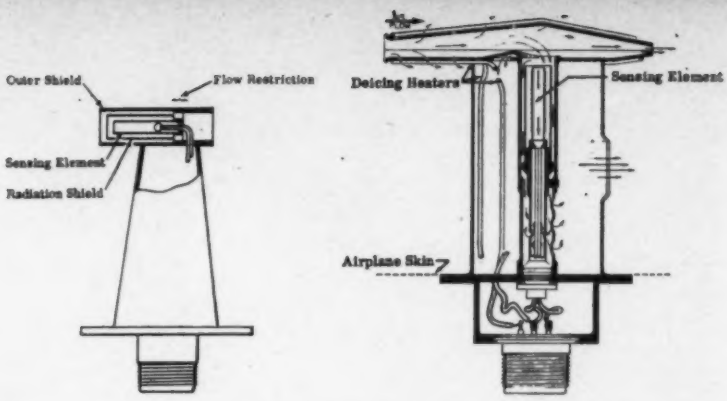


Total Temperature Probes

F. D. WERNER, BS, MS, PhD, R. V. DeLEO, BS. MS,* and B. ROGAL, BSc(Eng), AMIEE†



Figs 1 and 2. Models 101 (left) and 102 total temperature probes

TOTAL temperature measurement is much superior to skin temperature measurement. Temperature is essential to true airspeed measurement and various jet-engine control, fire control, and bombing computations. In general, either measurement would do equally well if of sufficient accuracy. For Mach numbers above 0.5, temperature of the ambient air cannot be accurately measured by a "flush bulb" (which measures aircraft skin temperature), by reason of the facts that (a) the recovery factor is uncertain and (b) an additional error creeps in because the Mach number at the bulb location may generally differ from the flight Mach number. Using typical installations for flush bulbs at respective Mach numbers of 0.6, 0.8 and 1.0, corresponding temperature uncertainties can be readily calculated as ±2.16, 4.86 and 6.01°C. This problem can be substantially eliminated by the use of total temperature sensors.

Extensive programmes have been conducted in the United States to determine the best methods of measuring total temperature, and three principal types of total-temperature sensors have been developed as a result. One type, not de-iced, has been widely used for Service installations and has an excellent reliability record. Pictured in Fig 1, it is identified as the Model 101 series. A second variety (Fig 2) permits application of de-icing power while still permitting accurate total temperature measurements and is known as the Model 102 series. A third type, specially intended for flight-test purposes, is similar to that shown in Fig 2, except that the de-icing power is omitted and the element is an open wire for very fast response and high recovery factor. It is also included among the 102 series.

Fig 3 shows the construction of the hermetically sealed element, in which the platinum wire is wound on a platinum tube, covered with another tube, and sealed with gold solder. Platinum tubes are used to ensure the uniform expansion of the platinum wire and supporting structure as temperature varies, thereby avoiding strain in the wire and promoting calibration stability.

Returning for a moment to Fig 2, the construction involves what might be termed internal boundary-layer control, in the following way: The increased pressure within the probe housing causes the internal boundary-layer air to move outward through the holes in the shell. Thus, heating of the shell for de-icing causes minimal disturbance of the temperature of the core of the airflow. This central flow is caused to turn 90° into the lateral conduit in which the sensing element is located. This turn eliminates water droplets by inertial separation.

Except for the de-icing characteristic, performance data obtained apply almost identically to both the 101 and 102 series. These results are summarized in Figs 4, 5 and 6. More detailed information is available from publications listed in the bibliography.

The resistance v. temperature relationship is expressed precisely in the Callendar-Van Dusen equation for pure platinum. A slight modification of the calibration curve by use of trimming resistors has permitted many total-temperature sensors to be manufactured with interchangeability of 0.1°C over the range from −50 to +150°C.

Fig 4 shows the speed of response, in terms of the time required for 63.2 per cent of the response to a step function of total temperature. The time-constant depends primarily upon total pressure behind the normal shock-wave. For the open-wire 102 series sensors mentioned, the response is more than 100 times faster (approximately 0.02 sec).

Radiation errors are negligible, being typically less than 0.1 per cent of absolute temperature up to Mach 2.5 and an altitude of 80,000ft. This applies to all three sensors by virtue of similarity of internal aerodynamic design, which includes radiation shields.

Fig 5 shows the recovery error, which is defined as the per cent error (per cent of absolute temperature). Fig 5 applies to the 101 and de-iced 102 series, but open-wire 102 series have recovery errors about one-fourth as large. The relation between recovery error ν and recovery factor r, as well as the definitions of ν and r,

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* Dr F. D. Werner is the president, and Mr R. V. DeLeo manager, of the Aeronautical Research Department of Rosemount Engineering Company, Minneapolis, Minn, USA.

† Mr B. Rogal is managing director of Research & Engineering Controls Ltd, Bognor Regis, Sussex, England.

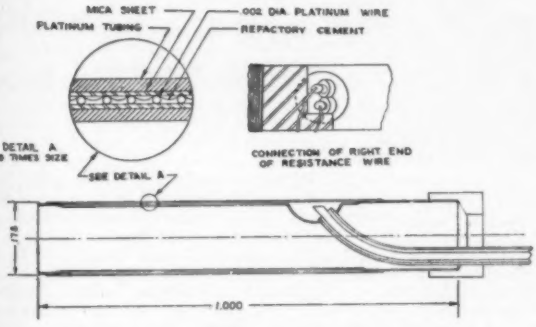


Fig 3. Construction of sensing element

Fig 4. Speed of response

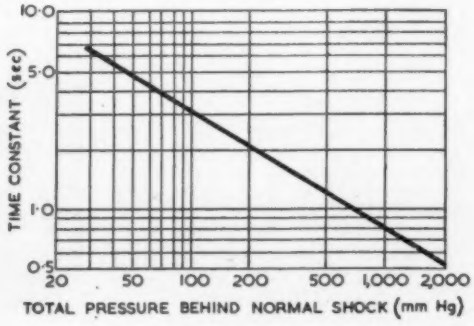
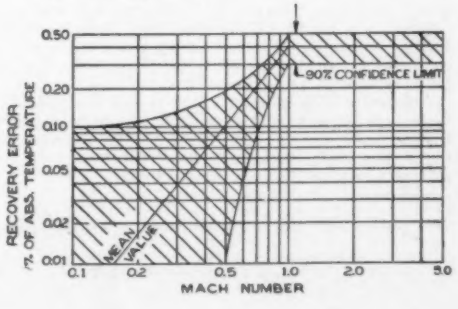


Fig 5. Recovery error



TOTAL TEMPERATURE PROBES...

are given in equations 3, 2 and 1 respectively. T is the static temperature, T_o is the total temperature, T_p is the measured probe temperature, γ is the ratio of specific heat (1.4 for air), and $\frac{T_o}{T} = 1 + \frac{(\gamma-1)\,M^2}{2}$

$$(1)\ r = \frac{T_p - T}{T_o - T} \quad (2)\ \nu = \frac{T_o - T_p}{T_o} \quad (3)\ r = 1 - \nu\left[1 + \frac{2}{(\gamma-1)\,M^2}\right]$$

Equations may be written for the recovery error shown in Fig 5, including the 90 per cent confidence limits, both in terms of r and ν. These are given below and represent the basis for the most precise correction for these small errors. When corrected by means of equations 4 and 6 or 5 and 7, uncertainties in total temperatures in dry air due to recovery error are reduced to 0.1 per cent of the absolute temperature. There is no significant dependence of γ or r upon altitude.

(4) Subsonic $= 0.004\,M^2 \pm 0.001$

(5) Subsonic $r = 0.980 - 0.004\,M^2 \pm \left(0.001 + \frac{0.005}{M^2}\right)$

(6) Supersonic $= 0.004 \pm 0.001$

(7) Supersonic $r = 0.996 - \frac{0.002}{M^2} \pm \left(0.001 + \frac{0.005}{M^2}\right)$

The power dissipated in the platinum wire has to be kept to reasonable values in order to avoid error in temperature measurement due to the self-heating effect. The angle of attack dependence up to Mach 3 and angles of up to 25° is negligible. Errors for the 102 series when the de-icing heater is applied rarely exceed 1°C, and detailed information has been obtained on this effect.

A detailed analytical and experimental study has been made of the effect of water droplets on the 101 and 102 series. Typical errors due to water droplets for the two types are shown in Fig 6. If a practical case is considered where the flights are conducted at a specific humidity of 0.001 at a Mach number of 0.4, the total-temperature error for the simple 101 probe is approximately 9.6°F and for the 102 probe the error is only 1.4°F. The differences are even more significant at Mach 0.5, since at the same specific humidity the total temperature error is 14.3°F for the 101 probe and only 2.6°F for the 102. More data are necessary if the Mach number effect is to be fully understood, but the trend is clearly evident.

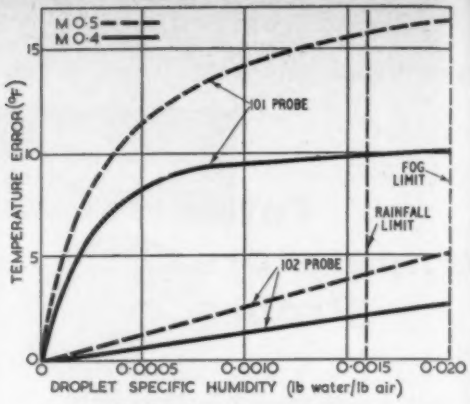


Fig 6. Effect of water droplets

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(2) Frank D. Werner and Richard V. DeLeo: "Temperature Sensing from Aircraft with Immersion Sensors," Instrument Society of America, Preprint Number NY60-91.
(3) Research & Engineering Controls Ltd; Bulletin number 126027 on 101 series.
(4) Research & Engineering Controls Ltd: Bulletin 7597 on 102 series.

THE INDUSTRY

Conveyancer Gain Capacity

ILLUSTRATED in column 2 the new factory and office block of Conveyancer Fork Trucks Ltd at Warrington, formally opened recently by Sir Alfred Owen, chairman of the Owen Group. In the course of his speech Sir Alfred said that since 1946, when the company delivered their first fork-lift truck, more than 12,000 of these machines had been produced; now they were operating in 92 countries and handling over 2½m tons each day.

The company's production is still expanding and the new 52,500 sq ft factory extension, costing £220,000, has been planned alongside the 70,000 sq ft assembly plant and the 30,000 sq ft spares and service department. Production is already laid out on an assembly-line system with overhead monorails, feeding assembly points in the existing plant. Transfer of sub-assembly manufacture and certain other processes to the new extension will make space for additional assembly lines. A new heavy machining section is also being established in the extension and will make additional space available at the company's Liverpool Road factory for expansion of the aircraft equipment manufacturing facilities there.

Conveyancer Fork Trucks Ltd originated as a development of Electro-Hydraulics Ltd, and certain aspects of the latter company's aircraft work were demonstrated in the research and development section during the opening of the new extension. They included proving tests on solenoid-operated valves and on pressure switches.

Part of the new buildings of Conveyancer Fork Trucks (see Col 1)

Avdel's New Premises

NEW office and factory premises were opened recently at Welwyn Garden City by Avdel Ltd, who until May this year were known as Aviation Developments Ltd. Following a greatly increased demand for their products, high-speed fastening systems, the company decided upon re-housing; and their new factory—a single-storeyed building—enables the whole production sequence to be carried out under one roof. The head office is being housed in a double-storeyed block.

Formed in 1936, with Sir Alliot Verdon Roe as first chairman, the company was engaged throughout the war in producing special fasteners for the aircraft industry. The decision to change the name was taken because a large proportion of the company's products go outside the aircraft industry.

Panoramic view of the new Avdel plant (news-item above)

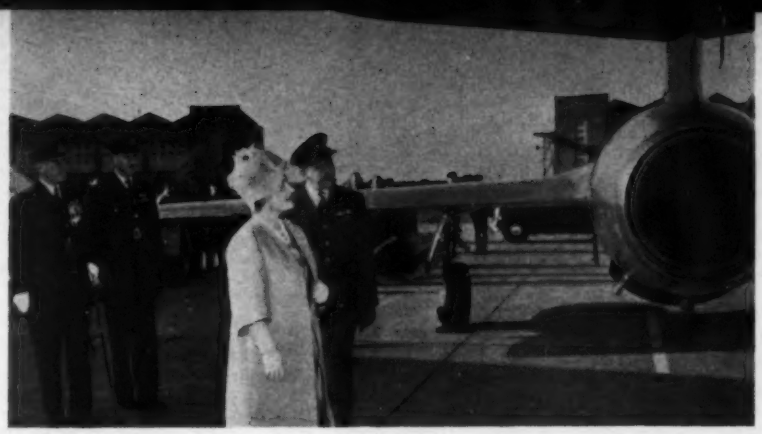
Death of Instrument Pioneer

WITH the recent death of Mr F. A. King, CBE, who retired from Kelvin & Hughes Ltd in 1955 after 55 years' service, one of the last remaining links with Lord Kelvin has been broken. Mr King became, in 1900, an assistant in the private laboratory of Dr J. T. Bottomley, a nephew of Lord Kelvin, with whom he was frequently in contact during this period. In 1912 Mr King opened the Lewisham branch of Kelvin, Bottomley and Baird; in this position he was in close liaison with the Royal Aircraft Factory concerning the design and production of compasses for aircraft and dirigibles. He became managing director of Kelvin, Bottomley and Baird in 1935 and was largely responsible for the erection of their Basingstoke factory, one of the first to be built in Britain solely for the manufacture of aircraft instruments. With the amalgamation of the company with Henry Hughes Ltd as Kelvin & Hughes Ltd Mr King became joint managing director with Mr G. B. G. Potter, holding this position until he became consultant director.

PRECISION ENGINEERING DIVISION manager at Short Bros & Harland: Capt I. F. M. Newnham, CBE, RN (Ret), whose appointment has been announced. Main activity of the division is design and development of guided weapons, including Seacat. Capt Newnham, who retired from the Navy in August this year, was Chief of Staff to the British Naval Staff in Washington, and Naval Attaché there, from 1959 to 1961

SERVICE AVIATION

Air Force, Naval and Army Flying News



Queen Elizabeth the Queen Mother inspecting a Hunter F.6 of 19 Sqn during her recent visit to RAF Leconfield. With her is the squadron CO, Sqn Ldr R. M. Raw; behind are the station commander, Gp Capt R. N. H. Courtney, and the Wing Commander Flying, Wg Cdr E. Batchelar

Ministerial Experience

AFTER his recent sorties in a Lightning from Warton and in a Victor from RAF Gaydon, the Air Minister, Mr Julian Amery, last week visited a Javelin all-weather squadron, No 33, at Middleton St George, near Darlington, Co Durham. Mr Amery, who had flown in from Church Fenton in a Devon, went up with the squadron's commanding officer, Wg Cdr D. L. Hughes, in a Javelin T.3, following-through a practice interception over the North Sea by one of the 33 Sqn FAW.9s.

Air Commodore Postings

TWO air commodore appointments are announced: Air Cdre A. H. McM. Hely, OBE, formerly a Director of Equipment at Air Ministry, has now taken over as Air Commodore Operations at Maintenance Command headquarters, a new post brought about by the recent absorption within the command of Nos 40 and 41 (Maintenance) Groups; and from the beginning of November his post at Air Ministry has been taken over by Gp Capt K. H. Gooding, OBE, the Senior Equipment Staff Officer at Bomber Command, who now has the acting rank of air commodore in his new post.

Survivor's Story

A PILOT of 75 Sqn, RNZAF, whose Canberra disappeared on a flight from RAF Tengah, Singapore, to RAF Butterworth in Northern Malaya, told his survival story at Singapore on October 30 after he had walked out of the jungle. Flt Lt Peter Bevan, a 26-year-old Cranwell-trained pilot, said that after take-off from Tengah his aircraft ran into storm clouds at night and was struck by lightning. The aircraft instruments became disoriented and it was thrown into an uncontrollable spin. Flt Lt Bevan ordered his navigator, Flg Off D. L. Finn, to bale out, then used his ejector seat. This was the third time he had had to abandon an aircraft.

Flt Lt Bevan's story continued: "I recall landing in a high tree and hanging there. I undid my harness and began to climb down when a branch broke and I fell. When I woke up it was daylight. I got out my survival pack and using the compass in it to guide me set off to the west through fairly heavy jungle till I came to the track. I followed this track but I did not know for how long. Eventually I met a man who took me to the police." Flt Lt Bevan was taken to the RAF hospital at Changi suffering from exposure, exhaustion, head and spinal injuries. His navigator is still missing.

To mark the RAF Benevolent Fund's work for the Service an oak table has been given to St Clement Danes by the executive committee of the RAF Church. Examining it are (from left to right) Rev T. Ryder, resident chaplain; Viscount Knollys, chairman of the Fund; Ven F. W. Cocks, RAF Chaplain-in-Chief; and AVM Sir John Cordingley, controller of the Fund

Off to the Philippines—

THREE Vulcan B.1s of 44 Sqn, based at Waddington, are to take part in the Manila Air Show in the Philippines on November 26, at the invitation of the Philippines Civil Aeronautics Administration. The detachment is led by the squadron commander, Wg Cdr J. A. G. Jackson. Captains of the other two aircraft are Flt Lts F. M. A. Hines and M. C. Hempstead.

—and to the West Indies

FOUR Shackleton MR.2s of 42 Sqn flew out last week to Kingston, Jamaica, to assist in British Honduras relief operations following the devastation caused by Hurricane Hattie. The squadron was given its task at 1600hr on November 1; the first two aircraft left St Mawgan at 2152 and 2229hr that day, the second two at 0730 and 0735 the following day. Wg Cdr J. R. Ramsden, CO of 42 Sqn, is leading the force; with him is Wg Cdr H. Mansell, to whom he is handing over command. The Shackletons are carrying out ferry and casevac duties.

IN BRIEF

The RAF Benevolent Fund has received £4,500 from the Society of British Aircraft Constructors "in appreciation of RAF participation in the Farnborough air show."

On November 1, 22 Sqn completed its 1,000th operational sortie on rescue, potential-rescue or casualty evacuation duties since becoming a search and rescue unit in 1955. Commanded by Sqn Ldr G. L. Verran and based at St Mawgan, the squadron has detachments at Tangmere, Chivenor, Valley and Manston.

Cdt Plt K. Berry is compiling a history of Liverpool UAS, and would be glad to hear from anyone having relevant information. His address is c/o University of Liverpool Air Squadron, RAF, Everton Road, Liverpool 6.

Wg Cdr Robert B. Sillars has been appointed CO of No 24 (Commonwealth) Sqn, based at Colerne and equipped with Hastings. His previous appointment, before taking a Varsity refresher course at Manby and a Hastings course at Dishforth, has been on the joint planning staff at the Ministry of Defence.

A reunion dinner for all past members of 219 Sqn and its associated servicing echelons is being held at the RAF Reserves Club, 14 South Street, Park Lane, London W1, on Saturday, November 25, at 6.45 p.m. Cost £1 10s; dress informal. Applications to Wg Cdr D. W. B. Farrar, 3 Beamish Drive, Bushey Heath, Herts.

Royal Flying Corps 50th anniversary celebrations next year will include a remembrance service on May 13 in the RAF Church, St Clement Danes. This was announced in a written Parliamentary answer last week by the Air Minister, Mr Amery, who said it was also proposed to invite the Imperial War Museum, Royal United Service Institution and Science Museum "to arrange appropriate displays."

Lt Robert Balls, of 771 Sqn, who made four sorties with food, coal and cigarettes from HMS "Ariel," Lee-on-Solent, to carry supplies to 15 men cut off by gales in the Nab Tower, Spithead, nine miles off Portsmouth harbour, taking off in his Dragonfly. The helicopter, which is based at Portland, was called in by Lee to transfer the supplies

FLIGHT SYSTEM SURVEY

BALPA Discusses Automatic Landing

ON Tuesday of last week, at Hounslow, Middx, the British Airline Pilots' Association held a forum on automatic landing. Several of the principal manufacturers concerned gave explanatory lectures and the pilots expressed some forceful opinions on the subject. Introductory remarks by Capt W. D. Wellwood, chairman of BALPA, and Capt M. W. Broom, forum sub-committee chairman, showed that the pilots were determined to make their requirements known at the planning stage. Pilots, said Capt Broom, were consumers but not customers; they had to use the equipment, but the operators who paid for it had not necessarily a knowledge of pilotage. Moreover, there was a strong feeling that teething troubles and insufficient training discouraged pilots from making use of such automatic devices as approach couplers. These were still not used in the great majority of poor-weather approaches. It was necessary to launch a publicity programme for pilots about automatic landing; and this was one of the main objects of the forum.

Capt Bressey Opens the Attack

While the manufacturers set a soothing and informative tone in their speeches, Capt P. E. Bressey, on behalf of BALPA, deliberately launched a rather provocative attack on automatic landing. Pilots were fairly happy about the progress with automatic landing itself, he said, but not at all happy about the overall way in which the problem was being tackled. They had had unhappy experiences with certain new equipment introduced in recent years. There were four main reasons for lack of enthusiasm for automatic landing:—

(1) Pilots tended to view with suspicion the introduction of any new device or procedure tending to undermine their powers of command —though once it has been proved successful in everyday operations on a world-wide basis they were willing to accept it. Past examples were GCA and automatic approach.

(2) Again, with recent history very much in mind, pilots found that such devices tended to be introduced into service before initial teething troubles were overcome, and it was usually the pilot who suffered during this "running-in" period. Piecemeal introduction of autolanding might mean that the full system would never materialize.

(3) From pilot participation in various working parties and committees at present dealing with autolanding problems, it appeared that insufficient attention was being given to the overall problem.

(4) Even if answers to the above three questions could be found, it still appeared that automatic landings were going to be possible only with *some* aircraft on *some* runways at *some* airfields under *some* weather conditions.

Capt Bressey then enlarged on these four points, as follows.

Delegation of Command The pilot was held ultimately responsible for a very valuable capital investment, the personal safety of his passengers, and was not unmindful of the fact that if anything did go wrong he was at the end which hit first. When GCA was going through its initial teething troubles a pilot could always have some check as to what the controller was doing with him by cross-reference to some other navaid. He could set his own limits, and if he was not happy at the way things were going, he could break off the approach and divert. Similarly with approach couplers—the pilot monitored the performance by his instruments and in many cases his critical height was higher with an automatic coupler than with manual flying.

"So far," continued Capt Bressey, " a pilot has never allowed any aid or device to get his aeroplane into such a dangerous position that he was unable to extricate it from this situation by taking over manual control. Now for the first time he will be asked to allow a series of black boxes to manœuvre his aeroplane right down to the runway surface. Unless he has full visual reference to the ground at his critical height he will from then on have little or no monitoring information; and in the event of a malfunction of the equipment below this height his chances of completing a successful overshoot will probably be slim. This means a complete reversal of his basic approach to fundamental matters of safety which has been drilled into him for 20, 25 or 30 years. Habit dies hard. Could a monitor help if something went wrong at 100ft? How could pilots keep in practice for manual landings? What would happen if automatics were the only means of landing?"

Teething Troubles The more complicated the device, the longer this period seemed to be, and this new device was nothing if not complicated. Equipment which worked perfectly in the laboratory, or under the carefully controlled environment of a test station, failed lamentably when it had to "rough it on the line," in an aeroplane which might be flying some 15 hours a day in and out of extremely varied climatic conditions (when standing on the ground at transit stops), and subject to maintenance by personnel new to the equipment.

"Admittedly," continued the speaker, "there is little or no danger involved during this running-in period, but if the serviceability rate is low, and the period prolonged, pilots tend to lose faith in the equipment, and will refuse to use it when it does work. I can think of at least two expensive pieces of equipment now carried on some British aircraft to which the above remarks apply."

The Overall Problem Much thought had been given to the airborne equipment proposed. " We hear talk," said Capt Bressey, "of failure rates of 1 in 10^{-9}, triplicated systems, triplex systems—and even of duplicate ground equipment. All this will, we hope, bring the aircraft safely to rest on the runway. Unless it can be safely removed from the runway fairly quickly, it is now just an obstruction preventing the next aircraft from landing.

"At many major airports, this 'removal from the runway' involves some pretty complicated taxi routing, and some even more involved manœuvring when reaching what is known as the 'marshalling area.' How this is to be done under conditions of zero-zero visibility, no one has yet explained.

"How passengers are to be removed from the aircraft without getting lost in the fog, and how all the servicing vehicles are to do their work, is not really a pilot's worry. But unless the aircraft is to sit on the tarmac until the weather improves, all these necessary functions must be performed, and then presumably the pilot will be asked to tax iout to the right end of the correct runway and get it airborne—or will all this too be performed on Autotaxi and Autotake-off? We should like to know."

100 per cent Utilization This was obviously the ultimate aim, said Capt Bressey—to land the passenger safely at the *right* airport at (approximately) the *right* time, *every* trip. He continued:—

"BLEU has amassed an impressive record of over 2,000 [8,000! —Ed] successful autolandings—some of them in almost zero-zero conditions. *But* I believe that all of these have been made in small or medium-sized straight-wing aircraft of fairly low wing-loading, and under only moderate cross-wind conditions.

"For world-wide application, autolanding will have to cope with large, heavy swept-wing jets, with high wing-loading, sometimes under strong gusty cross-wind conditions, perhaps even on an icy runway.

"Autolanding is based primarily on ILS, which has been the standard ICAO bad-weather approach aid for more than ten years. Yet in the whole Eumed region—and this takes in a lot of airfields —there are not yet a dozen airports which have more than one ILS at the end of one runway. Many have no glide-path, or one which is promulgated as 'unreliable.' Many more have no ILS at all and, because of terrain problems, little hope of ever having one. At those airports which are equipped with ILS, the serviceability rate often leaves much to be desired.

"Duplication of equipment, if the money can be found to pay for it, may help this problem to some degree in some locations, but we have a long way to go yet before we reach our 100 per cent goal."

Capt Bressey went on to quote Murphy's Law—"If it is possible to install something the wrong way, somebody sooner or later will do it that way." He quoted an instance of a British airliner which was longitudinally slightly unsuitable and had two autopilot controllers. On one flight it was put into level cruise at the top of the climb and the steward was called forward to the flight deck. The nose went down, and the co-pilot trimmed aft on the autopilot. The nose went further down; the co-pilot trimmed further aft; and a dive developed from which the captain recovered at high speed in a flight level reserved for traffic moving in the opposite direction. It was then discovered that the co-pilot's pitch control was connected in reverse. Now, the two controllers looked identical—same shape, same plugs, no indexing marks except for the last of a string of digits in the part number. But the captain's unit contained an override, so that the captain ultimately had control of the autopilot; and it so happened that if the captain's unit was mounted in the co-pilot's controller it worked in the

reverse sense. The pilots immediately asked themselves why, in several years of operation, this fault had never occurred before. The ground staff told them that it had in fact happened several times, but had always been spotted by the inspectors. It was then asked why the inspectors had not drawn the attention of the manufacturers to this blatant candidate for Murphy's Law and the reply was: "It would make us look rather fools, wouldn't it?"

During the subsequent discussion of Capt Bressey's contribution it was clear from many comments that automatic approach couplers are still used relatively infrequently. A BEA Comet 4B captain described an approach technique developed by his airline which involved the regular use of approach couplers. Once the equipment was used and the snags systematically rectified the equipment worked well. A BOAC Comet captain then wondered how BEA had had their approach coupler cleared for operation when identical equipment in BOAC Comets was wired off and placarded "not to be used." Other speakers noted that their approach couplers were not to be used below 1,500ft, yet another said that radar sequencing procedures at London Heathrow made it impossible to engage the coupler in time to make an automatic approach.

These and many more comments all illustrated Capt Bressey's point that teething troubles destroyed pilots' confidence in automatic equipment. It was obvious that pilots would never be reconciled to automatic landing, which involved much greater reliance on equipment, unless it worked better than approach couplers even in the early introductory stages. But it was also clear that equipment which got a bad name and was shunned early in its life could be made to work very successfully if the pilots consistently used it, reported snags and allowed the engineers to eliminate them systematically. Willingness to co-operate whole-heartedly in the difficult early stages was not so evident as the inclination to ignore new equipment after the first few unhappy experiences.

Visual Simulators

The operation and usefulness of the GPS Terravision visual attachment for simulators were explained by Mr Douglas Wilson, head of the simulator division of General Precision Systems. (Terravision was described in *Flight* for January 20, 1966). Mr Wilson noted that pilots might get their first visual experience of a poor-weather landing in a new airliner with a load of passengers behind them because marginal weather was hard to find for training. Minima were increasing rather than decreasing at the moment and pilots' ability was likely to decrease with the introduction of automatic landing. The visual simulator could help,.

Mr Wilson showed a film illustrating the view obtained during various kinds of simulated ceiling, visiblity and lighting conditions ending with some dramatic low flying. The visual attachment, he said, was in production and had been ordered for the RAF and BEA. One visual unit could be shared between several simulators. Future developments included use of colour TV, better methods of reducing visibility and provision of a limited circling capability.

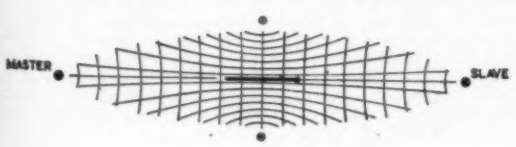
Decca for Landing Guidance

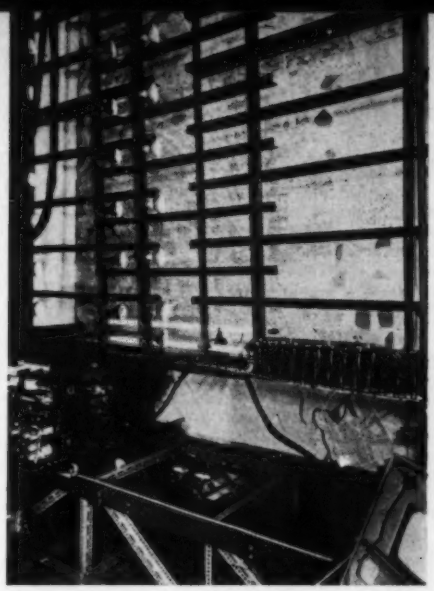
A description of a new application of Decca Navigator to landing guidance was given by Mr Claud Powell of Decca Navigator Co. The system is to some extent based on the small chains used for survey work and employs two stations, master and slave, disposed symmetrically beside the runway. They would, said the speaker, produce a hyperbolic pattern [see illustration] with the characteristics that, from the maximum range of eight miles to about two miles, the lanes would provide angular information and at shorter ranges would give displacement information. The centreline would be straight and cover the whole runway and both its approaches. Sensitivity would be 0.75ft on the runway and eight feet at eight miles, giving an overall accuracy of two or three times these values. Transmission of a second pattern in phase on the centreline only would resolve lane ambiguity, but ILS is envisaged for positioning the aircraft initially on the correct lane.

The transmitters would be mounted in vans and the aerials would be 25ft high. Transmission frequencies would be in the NDB band and "site consciousness" would be low. Ability to overcome static would depend on transmitter power, but reasonable powers should prove effective. The short ranges involved would greatly alleviate such problems. An airborne receiver might occupy less than ¼ ATR case. The beacons could be airportable.

A range pattern could be superimposed on the azimuth pattern either by the addition of two further beacons or of a further master.

Right, the Decca pattern for centreline guidance. Below, full pattern with ranging, using four transmitters





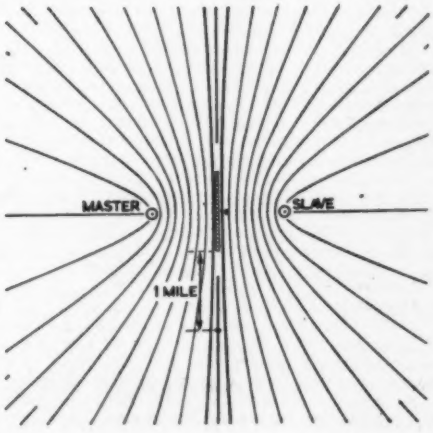
The model gantry and television camera assembly of the General Precision Systems' visual attachment

BEA Plans

Speaking from what was possibly the mid-point between the pilot and the designer, Capt F. Ormonroyd, BEA's flight technical superintendent, outlined the stages of equipment planned for the Trident and the benefits the airline hoped to obtain.

First stage for the Trident was autoflare, requiring no special ground equipment, but providing experience of automation. The autopilot would be duplex in pitch and roll and duplex in yaw for autostabilization only. Also provided would be a flight director working together with the autopilot, and PVD shuttered until used in case of a failure; duplex throttle control; auto-overshoot using the approach-speed lock, except after throttle-closing had begun during flare-out; three radio altimeters and flare computers serving autopilots and flight system; two ILS receivers, one for the autopilot and the other for visual monitoring; and attitude-hold phase for transition from glide-slope to radio altimeters. The first Tridents would be so fitted, but certification might not be complete.

The second stage was for gaining experience in good weather. It would involve a third ILS localizer and azimuth computer to give independent guidance to each autopilot channel, and a kick-off drift system in the duplex yaw channel. PVD would indicate failure and provide manual guidance. If suitable ILS was not available, normal ILS could be used in good conditions on 300ft-wide runways, such as at London Heathrow. [*Contd overleaf*



FLIGHT SYSTEMS SURVEY . . .

The third stage would see the disappearance of the independent monitor and application of its sensors to the third channel, for which mountings are already provided. Pitch and roll axes would be triplexed. Improved ILS was assumed, Leader Cable being unsuitable because siting difficulties were now known to be more severe than had been supposed. BLEU was developing a guidance system for the landing roll, to resolve the problem of pilot intervention at a late stage and to provide take-off guidance.

Some airlines thought sufficient improvement could be derived from better ILS and lighting alone, but BEA had ascertained that only automatics could provide a worthwhile economic gain in terms of cancellations or lengthy delays saved by the system. The value of increased traffic gained because of better regularity had been assessed as £300,000 per year at London and £100,000 at certain Continental airports. Direct reduction in operating losses was assessed at an annual average of £46,000 at London and £20,000 at six selected Continental points. The savings could be increased with blind taxying and passenger handling in dense fog.

An interesting point was that visibility often fell in a matter of minutes from the manual landing minimum of 400yd to the automatic landing minimum of some 50yd. Thus the time for which automatic landing would be useful could be fairly limited; and the take-off minimum of 150yd might prove the limiting factor if an aircraft could not take off on a flight which could have terminated in an automatic landing.

Failure in the critical final stage might be countered by injecting a fixed pitch-up signal into the flight director to cushion the landing. There was a one-in-twenty chance of having only a partial system available for the landing after a flight of 1½hr.

Guidance Development

Ground aids now being developed for automatic landing were summarized by Mr P. F. Mariner, assistant general manager of the radar and communications group of Elliott Brothers (London) Ltd. ILS, he said, was the only aid at present available; it was ubiquitous, and it formed a good basis. The outputs required were, however, change of position, rate of change of position and a datum point on the runway. ILS gave angular information with only marker beacons for range indication and was susceptible below 300ft to interference from stationary and moving objects.

Both Britain and the USA were following an evolutionary approach, Britain relying to some extent in the early stages on manual control of azimuth and the USA on manual control of elevation. BLEU had made more than 8,000 successful automatic landings and were working on Leader Cable, Leader Beacon and phase-comparison guidance systems. In the USA, Autonetics were developing an inertial system to take the aircraft from the ILS to the runway, with radio altimeters for flare-out. For ILS, directional and waveguide localizers were offering a limited improvement, but suffered from the usual interference problems. Gilfillan Regal was being evaluated at Atlantic City as Egal, without its DME-type ranging facility. A mechanically nodding aerial transmitted pulses every ¼° to define elevation over a 20° vertical arc.

Airborne Instruments Laboratory Flarescan also used a mechanically nodding aerial, but a different coding system to define a flare-out path in relation to ILS glide-slope. The intersection of ILS and Flarescan patterns was computed to derive range signals. It was to be tried by the FAA this autumn. Bell ALS was an automatic GCA requiring a separate computer programme for each type of aircraft and capable of handling only two aircraft at a time.

France had produced the ASV-23 microwave system which had been evaluated by BLEU. It used two localizers and two glide-path transmitters, with ranging by transponder. BLEU trials had given fair results. The Germans had a twin-beacon phase-comparison system in which a Doppler effect was derived for ranging.

The BLEU system was the most advanced, but disadvantages included siting and interference limitations of Leader Cable, the attitude-hold phase without positive pitch guidance and the fact that the radio altimeter system meant that some of the runway was used as a height-reference plane instead of a landing area. The first could be improved with microwave guidance and the second by an inertial system—but this was expensive. ASV-23 provided no guidance for roll-out, no all-round coverage and no flare-out. The Autonetics inertial system was expensive for an airline. Regal and Flarescan were elevation-only systems, but ILS could provide the localizer. BLEU system with Leader Cable or directional localizer might be combined with Regal or Flarescan, but there had been no proposal yet for the "ultimate" system.

Progress by Elliott Brothers

Mr R. W. Howard, manager of the Transport Aircraft Controls Division of Elliott Brothers (London), said that interest in all-weather landing systems was now universal. There were eight major automatic landing programmes in the world and 15 major companies had teams fully occupied with the subject. The FAA was making new rules and US airlines estimated they lost between £7m and £24m per year through poor weather. Some airlines were prepared to spend up to £60,000 per aircraft for effective equipment. Inability to operate in all weathers might become serious for airlines in the face of competition from high-speed railways, such as that now being built in Japan over a 300-mile route and proposals for 200 m.p.h. rail links on the Continent.

The question now was not whether automatic landing was to be applied, but how and how soon; and Britain was being overtaken in research and development effort. The pilot might or might not participate, but at the moment the fully automatic system was working and a manual system had not yet been successful.

Mr Howard went on to describe the monitored duplicate approach for the VC10, after noting that some of the Elliott autolanding devices were being flown in a Bendix B-25 in the US, he announced a new monitor display being planned for mounting in the coaming of the VC10.

Progress by Smiths Aviation Division

Giving a brief history of the SEP.5 autopilot, Mr W. H. McKinlay, engineering manager of the multiplex branch of Smiths Aviation Division, said that it had many new features, such as the ability to climb to and level-off at a preset height. Mentioning the initial stage of a duplex pitch channel for automatic flare-out with manual control of azimuth and PVD as the stand-by, he said that the additional servos for kicking-off drift could be easily added to form an automatic landing system at duplex level—one that could be used in normal minima to gain experience. Mr McKinlay continued, "Should BEA then decide to go on to full automatic landing, the conversion to triplex level will be straightforward."

The performance of the system in theory was now being checked in relation to wind and gust conditions and variations in the equipment itself, to make a theoretical assessment of its capabilities.

The Test Pilot's View

Flight test procedure used by his company during the extensive flying involved in proving new equipment was described by Mr R. A. Palmer, chief test pilot of Smiths Aviation Division. He also described the method used for checking out the Autoland installation in a new type of aircraft when the throttle control, approach coupling, flare-out and throttle closing sequences had to be matched and set. During this work over a period of years Smiths had made actual automatic landings in all conditions of weather, including thick fog, turbulence and high crosswinds. Another speaker confirmed that "several hundred landings" had been made with a "swept-wing, four-engined V-bomber of an undisclosed type." The application of Autoland in this case had been difficult, but it had been satisfactorily completed.

Mr Palmer remarked that inadvertent disengagement of the autopilot in the final autolanding phase could be extremely dangerous and that Smiths had developed a tactile release button which required significant pressure for release and in which the "feel" collapsed as the automatics became disengaged. The pilot could keep his finger on the button without fear of inadvertent operation.

Another point was that, in real fog conditions, the pilot tended to relax monitoring and look out of the window, even though there was nothing to see. Actual exposure to these conditions would be essential before pilots made routine automatic landings. Because instrument discipline and ability to absorb information deteriorated during the final stages of a blind landing, manual control was not considered feasible.

The General Discussion

Many questions were asked by the 40 or 50 pilots present at the forum. Monitors and automatic overshoot devices attracted considerable interest (it was remarked) but the designers held out no great hopes of providing a fully effective monitor at full safety level for the critical phase of the landing; and the pilot could in any case do very little to remedy a drastic failure then. Overshoot was also a difficult problem since it supposed that there had already been a failure. The pilot himself could overshoot best.

The fact that the captain was irrevocably delegating his command to black boxes at a critical moment obviously caused concern. Who or what was legally responsible for the safety of the aircraft and passengers? Ground guidance bothered most of those present, but Standard Telephones stoutly proclaimed that their new STAN 7 and 8, now being installed in Britain, was the most modern available and could provide the necessary accuracy. Interference and rapid change-over problems were being tackled.

Capt Bressey, summing up, said that a "basic rethink" was needed because of the delegation of authority to black boxes. Teething troubles must be few and the equipment must work all the time if confidence was not to be lost at the outset. Ground aids would require urgent attention if they were to meet the requirements. ICAO would tighten up the ILS specification next year, but countries would have to be persuaded to install and maintain the system. It was also stated that pilots must work to dissuade operators from introducing simplified automatic systems which offered a low level of safety.

"Flight" photographs

A note on this page records the start of Avro 748 route-trials in the hands of Skyways. Seen with G-ARMV at the independent's airport at Lympne last Thursday, November 2, are (l to r): Avro's chief test pilot, Mr J. G. Harrison; Miss Vanda Roberts, Skyways' chief stewardess; and Capt J. S. Morgan, chief pilot and operations manager. Capt Morgan is in charge of the programme. On the right, DC-3 replacement and DC-3

AIR COMMERCE

Avro 748 in Skyways' Hands

FINAL phase in the certification tests of the Avro 748 began last Monday, November 6, when G-ARMV embarked on a 160-hour programme of route flying. This programme has been entrusted to Skyways, and it will be conducted in two nine-day instalments with a day's break in between for maintenance. Daily utilization will average about nine hours, and the aircraft will be handled by Skyways' pilots and serviced by Skyways' engineers.

The ARB requires that this final phase of the certification programme shall be as representative as possible of airline service, and Avro staff will not be participating except in a behind-the-scenes way. No Avro pilot will be on board flights. The routes to be flown will be from Skyways' airport at Lympne, where the aircraft will be based, to Beauvais, Vichy, Montpellier and Lyons. As Lympne is not equipped for night flying, Gatwick and Manston will be included—as they are in Skyways' actual Coach Air operations—in the programme.

Main financial responsibility for this final phase of ARB certification tests falls on the manufacturer, but obviously the experience gained will be of considerable value to Skyways. To date six DC-3 captains have completed their 748 conversions at Avro's Woodford airfield, following classroom instruction with Avro and Rolls-Royce. Conversion was, as *Flight* heard during a visit to Lympne last week, "remarkably easy."

The route flying now under way will not give Skyways the opportunity for converting a further six 748 pilots, but it will provide continuation-training for the converted crews, and will contribute to the 50hr command time required by captains. When the programme is over G-ARMV will be returned to its manufacturers. Actual delivery and acceptance are not required until March 1, giving Skyways a clear month in which to prepare for the scheduled services due to start on April 1.

Skyways are expecting to get 2,200hr a year out of each of their three 748s, all of which will be delivered by May 1. This is considerably more than is achieved by the company's four DC-3s, which do about 1,500hr a year each. There are two reasons for this big difference in utilization: firstly, the full-scale progressive maintenance system which will be applied to the 748 will not require the aircraft to be in the hangar for the longer periods required by the DC-3; secondly, the 748 is likely to prove more attractive to charterers than the old DC-3, enabling utilization to be kept up in the winter.

The 44-seat interior of G-ARMV is finished in every detail, and is attractively trimmed in grey-blue with a mustard carpet and 11 rows of two-by-two seats (33lb double units by Aircraft Furnishing Ltd) at 36in pitch. Baggage is accommodated in two webbed bays just aft of the flight deck, and a roomy galley at the back has a unit detachable for non-catered operations.

First customer to take delivery of the 748 will be Aerolineas Argentinas, who have nine on order. Avro have already converted 12 Aerolineas pilots at Woodford and delivery of the first aircraft, due to fly soon, is likely in December, soon after the award of the C of A. The three 748s so far flown have logged some 1,100hr.

NINE INDEPENDENTS FALL

INDEPENDENT airlines seem to fall, like the leaves, in the autumn. Around this time last year the following companies ceased operations: Continental, Don Everall, Air Condor and Orion. This autumn Pegasus and Falcon have ceased operations, and now Tradair and Air Safaris are in difficulties. In the last 12 months nine British independents, including Overseas (during August), have gone into liquidation, been put into the hands of a receiver, or have ceased operations.

The fundamental reason for the difficulties of Tradair and Air Safaris lies in Section 2(2)(a) of the Licensing Act. This is the section that requires the Board to consider the adequacy of the financial resources of applicants for licences. Both companies had applied for a large number of B licences for ITs, about 120 in the case of Air Safaris and about 90 in the case of Tradair. These applications were heard by the Board, together with some 600 applications from other operators, in a marathon series of meetings (*Flight*, July 27, page 131) in July, August and September. No decisions have yet been published, but the Board has been advising certain applicants that, unless their financial resources are strengthened, applications may be refused.

Both Air Safaris and Tradair have been trying hard to obtain new capital during the last few months, but have found it difficult to do so without being able to show, as security, a programme of work. This vicious circle has led to Tradair being put in the hands of a receiver, and to Air Safaris ceasing operations.

Tradair are not yet suspending operations, although their two Viscount 707s are to be grounded. Flying will continue with the company's seven Vikings. Mr Henry Porter of Tradair assured *Flight* last week that there was "no despondency," and no question that the airline is going into liquidation. In his view the Board's decision to implement the requirements of 2(2)(a) so quickly, without having given small companies time to recapitalize, is unfortunate, though he emphasizes that this is his only criticism of the Board's interpretation of its duties.

Air Safaris have completely suspended operations of their five Hermes and eight Vikings, which have been grounded. This company's efforts to recapitalize during the past few months have not, as this issue went to press, succeeded, and the problem now is whether the company can hold out during the winter. The staff, amounting to about 200 people, is under notice. The chairman, Mr W. E. Hamilton, has said that since the failure of Overseas Aviation "credit just has not been available to us in a normal way." He added: "If we are successful in recapitalizing then we shall fly again. But at the moment our position is not good."

A factor in the demise of some independents is the increased cost of engineering and maintenance required to comply with the tighter safety requirements, in particular with the requirements of the air operator's certificate. This is not likely to have been a factor in the case of Tradair and Air Safaris, whose safety standards have always been of the highest.

Speaking at the inaugural meeting of the International Federation of Air Traffic Control Associations (news-item below) is the president, L. N. Tekstra, of the Netherlands. At the committee table are, l to r, R. J. Sadet, Belgium; H. Thrane, Denmark; M. Cerf, France; Mr Tekstra; H. W. Thau, Germany; and W. Endlich, Germany

AIR COMMERCE...

AIRLINER MARKET PLACE

AEROVIAS SUD AMERICANA INC (ASA International Airlines), which is to merge with Riddle Airlines, has acquired two Martin 4-0-4s from Eastern, and will presumably begin passenger services with these to supplement its all-cargo services from Latin America to Florida. This is perhaps the most interesting sale recorded in the current range of Air-Britain publications, which serves to emphasize that the disposal of big piston-engined fleets is a slow, although a continuing, business.

Eastern has sold two more 4-0-4s to Southern Airways Inc, and may dispose of ten more of this type to Mohawk. Northern Express Airways has acquired a second ex-American Airlines Convair 240, while Jugoslovenski Aerotransport has acquired an ex-Alitalia Convair 440 to add to its two Convair 440s and one Convair 340. Delta has sold a DC-3 to Executive Air Transport, a US "non-sked," while Tunis Air has returned a DC-3 to Air France in exchange for a DC-4 taken over from Air France. Flugfelag Islands hf (Icelandair) has acquired a DC-6B from SAS, while TWA has sold or leased an L.1049G and an L.1049H to Trans-International Airlines Inc, the Florida-based "non-sked."

There is some interesting news of re-equipment among the smaller, outback operators. Air Gabon has taken delivery of an Aero Commander 500B, while Flinders Island Airlines (Pty) Ltd, which operates between Victoria and Tasmania, has acquired a Beech Super 18. The Chilean national airline LAN has sold its remaining two L.10A Electras to an Alaskan carrier, Inlet Airlines Inc. Macao Air Transport (Hong Kong) Ltd has bought a Piaggio P. 166 to replace its single Catalina used on regular services between Hong Kong and Macao Island, while an example of the Swiss Pilatus PC.6 Porter has been delivered to Deutsche Taxiflug GmbH.

TRAFFIC CONTROLLERS FEDERATE

IN the presence of some 250 representatives of the world aviation industry and legislative bodies, 12 European air traffic control guilds and associations formed the new International Federation of Air Traffic Control Associations in Amsterdam on October 20. This is an important step which indicates the impact the traffic control profession is having and will continue to have on the aviation industry; and it cements the desire of controllers to carry their interest in air safety beyond the boundaries of national frontiers.

National associations which have already joined are those of Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Holland, Norway, and Switzerland. The UK Guild of Air Traffic Control Officers is expected to join shortly, particularly as the Constitutional Conference held on October 19 decided that the new Federation would devote itself entirely to professional matters affecting air traffic control to the exclusion of all staff association or trade union business. This is, of course, in keeping with the constitution of the Guild of ATCOs. A representative of the ATC Association of Israel was also present at the Amsterdam meeting.

The intention had originally been to found a European Federation only, but it became clear that there was a desire to federate the interests of air traffic control beyond the European region, and therefore a decision was made to form the International Federation.

Headquarters will initially be in Cologne, and the first president is L. N. Tekstra, chairman of the Netherlands Guild of Air Traffic Controllers. H. W. Thau, chairman of the German ATC Association, was elected secretary. Other officers elected were: first vice-president, M. Cerf (secretary, French ATC Association); second vice-president, R. J. Sadet (vice-president, Belgian Guild of ATCOs); treasurer, H. Thrane (treasurer of Danish ATC Association); editor of IFATCA Journal, Walter Endlich (editor of *Der Flugleiter*, journal of the German ATC Association).

The inaugural meeting began with an opening address by J. W. F. Backer, Director-General of the Netherlands Department of Civil Aviation, and an inaugural speech by the first president. After the representatives of the 12 founder-nations had signed the convention there followed addresses by representatives of IATA (J. L. Gilmore), the Eurocontrol Association (R. M. Soward), IFALPA (C. C. Jackson) and GATCO (L. S. Vass).

Mr Tekstra, the new organization's president, said that the main constitutional principle was that of "co-operation on technical professional matters, the fundamental objects being the furtherance of safe and efficient air navigation and protection of common professional interests." Although some of the member-associations performed the dual function of technical association and trade union, IFATCA itself was not a federation of trade unions, but a purely professional body. It would form working groups to study technical problems and maintain contact with other aviation associations. It would also send observers to any regional European meeting and regional meetings of ICAO considering matters associated with traffic control, and would make recommendations for consideration by the relevant authorities.

THE MAHARAJAH KEEPS SMILING

IN a moment of promotional genius Air-India some years ago invented that benevolent figure the laughing Maharajah. If he has studied his airline's annual report for 1960-61 he should be feeling particularly genial, for he will have been reminded that Air-India International enjoyed a year of record financial success, their operating profit rising sixfold to Rs12m (almost £1m). Credit for this improvement was due both to the introduction of Boeing 707s and to the negotiation of pool agreements, the combined effect of which was to raise revenues by as much as 52 per cent (to Rs192m), while costs increased by only 45 per cent.

Underlying the revenue improvement was a 42 per cent increase in traffic—particularly noticeable on the India - UK routes, which showed a sharp rise after a two-year decline. The report attributes this to the tripartite Air-India/BOAC/Qantas pool, the effect of which was "to obtain for the partners a greater share of the available traffic in the face of severe international competition." The pool allowed Air-India to introduce a New York service rather earlier than would otherwise have been possible, and it also permitted the airline to retain its uncompetitive Super Constellations on the run to Indonesia and Australia. The revenue position was also enhanced

A little-known Argentine independent is Aerolineas Carreras, one of whose remarkably clean C-46s was photographed by "Flight" recently at Miami, Florida

The first of three Avro 748s for Skyways was flown to the airline's base at Lympne on Wednesday, November 1, and began the final route-testing phase of its certification programme last Monday, November 6. *(See page 743)*

by sharply improved revenue rates—although it is not possible to determine from the report to what extent this was due to higher fares or the receipt of a favourable share of the BOAC/Qantas/Air-India pool revenues.

Had it not been for the Boeings, the airline's costs would have risen well above revenue, for capacity was increased by as much as 73 per cent compared with the figure for the previous year. As it was, the 707s proved both reliable and economical, and were thus instrumental in realizing a 15 per cent cut in average unit costs to the equivalent of 30 pence/c.t.m. As a result, the airline was able to make substantial profits, despite a sharp reduction in load factors to below 50 per cent and a sharp increase in staff from 4,821 to 5,487.

The report forecasts that these low load factors will persist until 1962-63, "by which time demand should have caught up with the increase in capacity." By then, Air-India will have its full fleet of six Boeings in operation and will have disposed of its Super Constellations, probably to the Indian Government for military purposes. Meanwhile, a lean period is foreseen. Faced with spare capacity (the report concludes) the industry should attempt to bring air travel within the reach of a wider market through the introduction of more attractive fare-structures.

VITAL VC10 STATISTICS

A NOTE in last week's issue reviewed changes recently made in the specifications of the VC10 family, and the table below summarizes for quick reference the leading particulars of each of the three basic types.

Price of the standard VC10 at present stands at £2.2m, and that of the Super VC10 at £2.5m. These prices relate to aircraft delivered complete in every respect except for the passenger seats.

	Standard VC10	Standard VC10 (developed)	Revised Super VC10
Powerplant (four Rolls-Royce Conway)	RCo.42/1 of 21,000lb	RCo.42/1 of 21,000lb	RCo.42/3 of 22,500lb
Span	140ft 2in	140ft 2in	140ft 2in
Length	158ft 8in	158ft 8in	171ft 8in
Height	39ft 6in	39ft 6in	39ft 6in
Wing area (gross)	2,800 sq ft	2,800 sq ft	2,800 sq ft
Max internal cabin width	11ft 6in	11ft 6in	11ft 6in
Max number of seats (with galleys)	135	135	163
Corresponding pitch	34in	34in	34in
Underfloor cargo capacity	1,350 cu ft	1,350 cu ft	1,950 cu ft
Fuel capacity (Imp gal)	17,940	17,940	19,315
Max take-off weight	299,000lb	310,000lb	322,000lb
Max landing weight	199,000lb	206,000lb	225,000lb
Max zero fuel weight	178,000lb	184,000lb	200,000lb
Typical payload	35,500lb*	38,000lb	45,000lb

*Weight limited

TWOPENCE A MILE BY BEA

LAST Wednesday, November 1, BEA introduced the world's cheapest scheduled air fares on its routes between London and Glasgow, Edinburgh and Belfast. Shortly before midnight, every night of the week except Saturdays, the new "cheapest-fare" Vanguard and Viscount flights will leave London Airport for Glasgow, Edinburgh and Belfast. In each case the single fare will be 3 gns and the return fare exactly double. This new very low fare, recently approved by the Air Transport Licensing Board, works out at 2d per mile per passenger, cheaper than second-class rail fare.

Each Vanguard will carry, in addition to passengers, an average of three tons of mail and some two and a half tons of newspapers on its nightly flight from London to Glasgow. The London - Belfast Viscount will carry some two tons of mail and more than half a ton of newspapers. The GPO estimate that about 41m letters a year will be delivered up to 24 hours earlier in some parts of England, Scotland and Northern Ireland than would otherwise be possible as a result of the introduction of the new BEA night-mail services. London newspaper deliveries to Scotland and Northern Ireland will also be speeded up by several hours and later London editions made available on the breakfast table.

In operating these new, cheap night flights BEA is utilizing to the full the versatility of the Vanguard, which was designed from the outset to carry its full ten-ton payload made up entirely of passengers or entirely of freight or a combination of both. In order to accommodate the heavy mail and freight loads the Vanguard's normal 113-passenger complement is restricted to 60 on its northbound flight to Glasgow. Passenger complement on the flight from Glasgow to London, with three tons of mail on board but no newspapers, will be just under 100. The London - Belfast Viscount can carry 26 to 36 passengers on weekdays but a full 58-passenger load, in both directions, on Sundays.

Footnote: BEA were permitted to inaugurate these services pending publication of the Board's official decision. British Railways will have 21 days from publication of the decision in which to appeal. If an appeal is lodged, and if it is upheld by the Minister, the Air Transport Licensing Board can be directed by the Minister to revoke BEA's licence.

BAHAMAS AIRWAYS REVITALIZED (continued from page 735)

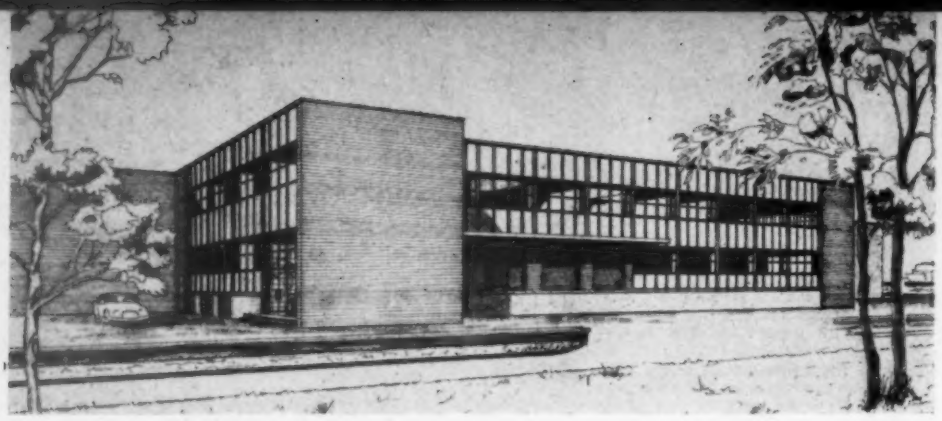
—Florida. I am convinced that we must continue to participate in Florida services, though I would say that our economics need not be predicated on these routes. We shall never be a primary carrier on the Florida services, but the point is that Pan American, Mackey and Cunard Eagle are all able to get island terminals for direct routes from Florida. Bahamas Airways is a self-feeder and must continue to remain so."

We asked Air Cdre Powell whether he was intending to augment his fleet of two Viscount 702s. These two aircraft, transferred to Bahamas Airways from BOAC's other subsidiary Kuwait Airways (and whose interiors have been most attractively restyled, one by Fields and one by Scottish Aviation), were introduced into service in place of the Hermes on July 15. Air Cdre Powell did not think that a third Viscount would be required, at any rate for some time.

Cunard Eagle's appearance on the Nassau - Miami route early in 1960 was partly instrumental in the decline of BAL, and in its repossession by BOAC. The two airlines had been competitors, all out to do each other down—internecine rivalry between two British colonial carriers whose real adversaries are Pan American and, to a lesser extent, Mackey. The Bahamas - Florida route, busy though it is, cannot really sustain four carriers; and if the two Bahamas-designated carriers had not agreed to regulate the competition between them, the Bahamas Government would no doubt have stepped in. We asked Air Cdre Powell about the "non-aggression pact" recently agreed between the two airlines. He did not want to say much about its precise terms—nor did Mr H. P. Snelling, Cunard Eagle's general manager in the western hemisphere, to whom we also spoke. But it is known that both airlines now have an agreement on their timetables and on the interchangeability of passengers. We formed the impression, too, that the airlines might come to an agreement about Viscount maintenance, spares, servicing, and possibly handling, with the object of cutting down costs. And we would hazard a guess that a revenue pool agreement might be an inevitable consequence of a closer working relationship, though US anti-trust laws would have to be watched. In view of the fact that the CAB is now itself examining, with the US Department of Justice, the legal aspects of pooling by US carriers, a pool between Bahamas Airways and Cunard Eagle on the Bahamas - Florida route would seem unlikely to run aground on that score.

It was last spring that the two airlines first began to draw closer together, when Air Cdre Powell agreed to withdraw his appeal against a decision by the Bahamas air licensing authority to allow Cunard Eagle traffic rights for its mid-Atlantic Britannia service between Nassau and Miami. It was probably this gesture, made soon after Air Cdre Powell's accession to power, that marked the end of the pointless rivalry between two British-designated airlines on a route between British and US territory.

We asked Air Cdre Powell whether BOAC Associated Companies gave him the executive freedom he needed to get a badly run down airline flying back into profitability again. "I have a great deal of freedom," he said, "though obviously I would not take a major step without consultation." We asked him when Bahamas Airways would be in the black again. His reply was: "We are not far up the hill yet, but we are a long way from the bottom."



Pan American is constructing a new £100,000 building at London Airport to house a catering centre, communications department and central reservations control. Located next to PanAm's hangar, it is due to be occupied late next April

AIR COMMERCE...

Chopin to Pop

PALMA has undoubtedly been the high spot of this year's European air traffic pattern. During the summer months, traffic from Britain—Palma's leading customer—has been up by something like a third compared with the summer of 1960, and the autumn traffic has been so exceptional that many hotels have delayed putting up their shutters for the off-season.

It is probable that the number of passengers to pass through Palma's airport in 1961 will approximate to a record three-quarters of a million.

A recent analysis of Palma's traffic for 1960 gives some indication of the composition of this business. The most noticeable feature has been the highly seasonal nature of movements: from the trough months of January and February, traffic rises to a peak in the months of July, August and September some eight times higher than the trough. If Spanish national traffic is excluded, the ratio rises to 12 : 1. This is even more remarkable when it is recalled that Majorca first achieved touristic fame as the winter retreat of Chopin and George Sand; and it continued to rely primarily on winter custom until as recently as some ten years ago. Indeed, so full-circle has the tourist wheel turned that a team of travel agents has recently been exploring the island with the object of developing the winter side of the business.

The reason for this remarkable transformation can be found by inspecting the list of airlines serving Palma. Excluding Iberia and Aviaco (the two Spanish airlines carried about half of the 638,000 passengers who arrived at or departed from Palma by air in 1960), the foreign airlines carried almost twice as many passengers on charter flights as they did on scheduled services. This charter traffic consists almost entirely of people who were not able to afford a fortnight's near-guaranteed sun in the Mediterranean until the travel agents got together and evolved the cut-price package tour.

FOREIGN AIRLINE TRAFFIC TO PALMA, 1960 (PASSENGERS IN AND OUT, × 1,000)

Nationality of airline	Scheduled operators	Charter companies	Total traffic
UK	64	86	150
Scandinavia	3	48	51
Germany	—	42	42
Switzerland	9	16	25
France	11	8	19
Belgium	15	3	18
Netherlands ...	14	1	15
Others	7	7	14
Totals	123	211	334

In terms of passenger traffic the leading Palma carrier was Iberia, though the majority of this airline's business was carried on domestic flights from the mainland. The second Spanish airline, Aviaco, also concentrated on domestic services—those linking Majorca with the neighbouring islands of Minorca and Ibiza. Of the foreign airlines, BEA stood head and shoulders above the others, although the British independents together carried rather more Palma traffic, the leading carriers being Overseas Aviation and British United. Together, BEA and the independents carried 150,000 passengers, equivalent to about one-half of the total carried by all non-Spanish airlines.

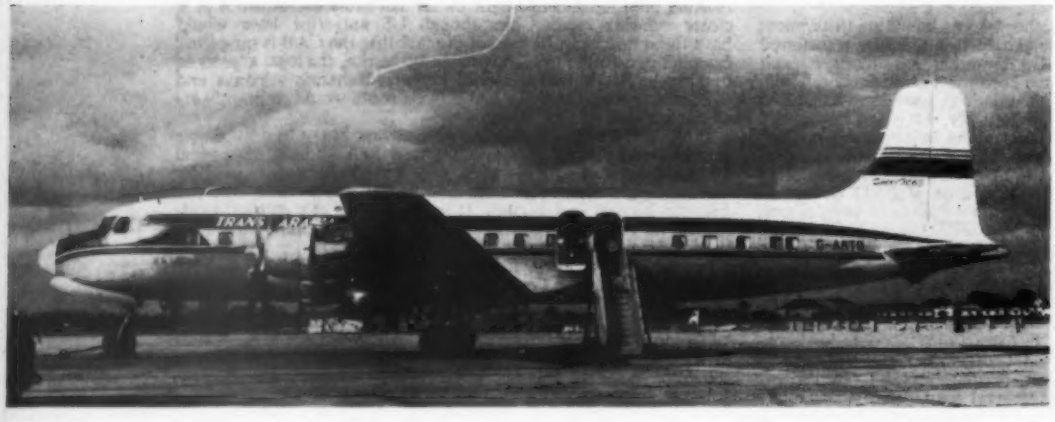
PRINCIPAL CHARTER OPERATORS TO PALMA, 1960*

Operator	Passengers × 1,000
Transair Sweden	23
Overseas Aviation	22
Flying Enterprise	18
British United	17
Balair	16
Condor (Germany)	14
Deutsche Flugdienst	10
Tradair	9
Continentale (Germany) ...	9
LTU (Germany)	9
Cunard Eagle	8
BKS	6
Starways	6
Airnautic (France)	5

* Including all airlines which carried over 5,000 passengers, in and out combined.

A notable feature of the traffic to Palma from the Continent is that it is even more packaged in character than is that from the United Kingdom. Indeed, the traffic from Scandinavia and Germany is almost entirely so, with charter companies carrying 90,000 passengers (Scandinavia 48,000, Germany 42,000) as against a mere 3,000 scheduled passengers (all by SAS). Swiss traffic was also predominantly charter (Balair 16,000 passengers, Swissair 9,000). For the remaining less important markets, scheduled operators carried most of the business.

The growth of packaged tours to Palma—notably, in recent years, from Germany and Scandinavia—is apparently having the effect of chasing away a proportion of more sophisticated travellers to more remote resorts. If Palma's popularity is to continue, the island's tourist authorities would be well advised to keep this trend under consideration, for the fickle taste of the mass market is a precarious base for any economy.



This DC-6B, G-ARTO, passed through Heathrow recently on its delivery from the USA to Trans Arabia Airlines in Beirut. The aircraft is ex-American Airlines and will be joining Trans Arabia's two other DC-6s and a DC-4, all British-registered aircraft

The first of two Boeing 720Bs to wear the red, white and blue livery of the western hemisphere's oldest airline, Avianca of Colombia, takes off from Renton on its maiden flight. It will go into service on the Bogota-New York route and also from Bogota to Madrid, Paris and Frankfurt

REGULARITY AND PUNCTUALITY

IN the correspondence columns of *Flight* in recent weeks there has been controversy about the comparative dependabiluty of corporation *v.* independent services, and BIATA have pointed out that their regularity record in 1960-61 was 99.7 per cent, compared with 98.1 per cent for BOAC and 97.2 per cent for BEA.

Regularity is defined as the percentage of scheduled flights operated; but, of course, no account is taken of punctuality in this index of dependability. Even if a flight is delayed 24hr it still counts towards 100 per cent regularity. The independents make most of their scheduled flights in the summer, when the weather—which gives the corporations' regularity a hard beating in the winter—seldom interferes.

In this context it is not always appreciated that stand-by aircraft play an important part in the attainment of good regularity figures. BEA, for example, reserves one aircraft for stand-by cover for approximately every eight actually flying. The plan for the recent summer was as follows:

Type of aircraft	Number operating	Number on stand-by	Number on maintenance	Totals
Viscount V.701 ...	17	1 at Manchester 1 at Jersey	4	23
Viscount V.800 ...	29	4 at LAP	6	39
Comet 4B (incl. Olympic Airways)	15	2 at LAP	1	18
Vanguard ...	7	1 at LAP	2	10
Totals	68	9	13	90

Thus a total of nine aircraft, representing perhaps an investment of £4½m, is deliberately kept on the ground without producing revenue, all in the interests of regularity. A further 13 aircraft are undergoing maintenance at the same time.

Of course, scheduled airlines do suffer delays; but to save a lot of argument it would be interesting to see figures published for both the corporations and the independents, not only for regularity but also for punctuality.

CHANNEL ISLANDS MARATHON

THE first part of a prolonged series of ATLB hearings, Public Meeting 57, lasted for approximately 13hr, when some 16 applications were submitted covering scheduled services and inclusive tours to the Channel Islands. Another round started yesterday, November 8, when a further 13 applications were due to be submitted. Nearly 40 objections by nine operators and the British Transport Commission were heard. Recently *Flight* recorded that BEA is to relinquish its 25 per cent holding in Jersey Airlines, "to avoid the possibility of any conflict of interest inherent in a shareholder being also a competitor." At these hearings BEA was, in fact, contesting four of the five Jersey Airlines applications.

Revealed at the hearings, which have received little publicity, was the lack of good hotel accommodation in the Channel Islands, which are nearing saturation point. According to evidence submitted, guest-capacity increases in 1962 will not exceed 1,000 beds in Jersey or 200 in Guernsey, i.e., not more than 2 per cent. This factor could retard traffic growth considerably.

The applications for variations in licences already held by air operators were mainly for increases in frequency and operation on days other than Saturdays. Dan-Air, Cunard Eagle and the BUA Viscount services at present operate only on Saturdays; BUA, for example, were asking for an increase in capacity and permission to operate on Fridays and Sundays as well.

At least one example of an airline attempting to discard shackles which restrict its operations came to light. On the Manchester-Jersey route approximately two-thirds of Jersey Airlines' services during peak periods have to make a compulsory call at Bournemouth. This, according to a Jersey Airlines witness, will create operational problems when the present Manchester-Jersey airway is moved westward in 1962; this will increase the distance from Bournemouth to the joining point on the airway. The traffic on this route is, according to evidence presented, predominantly Manchester-Jersey, and sector traffic is very small.

Another route affected by this type of restriction is the Jersey Airlines service from Gatwick, where the present licence calls for 50 per cent of the flights on some of the services to call at two places in the Channel Islands. Calls have also to be made at Alderney—which, by reason of airfield limitations, compels the use of Herons and limits the operation of Heralds.

The Board's decisions have not been published as this issue went to press, but obviously not all the carriers will get the *carte blanche* on capacity applied for. The overall impression is that the airlines want large increases in capacity and frequencies, while the Channel Islands facilities are unable to expand at a comparable rate to meet increased demand, even if the traffic is forthcoming to fill increased capacity.

AIR BUS MAKES MONEY

ACCORDING to the president of Eastern Air Lines, Mr Malcolm McIntyre, the company's Air Bus services are "definitely making a profit." Soon, he says, operations will be at a level where profits could be made even if the equipment used (Super Constellations that would otherwise be surplus) were not fully depreciated. Described in *Flight* for July 20, 1961, these services, also known as Air Shuttle, are soon to be extended to serve US cities other than New York and Boston.

The difference between these no-reservations services and those pioneered by Allegheny (*Flight*, May 27, 1960) is that passengers turning up at the airport are certain to get a seat. Much publicity play has been made of cases where aircraft have been brought up to carry just one passenger. This does not happen often (and perhaps mostly when Eastern's publicity boys are at hand) but overall load factor is still 50 per cent—and the word gets around.

The New York-Washington and New York-Boston services fly every hour on the hour from 7 a.m. to 10 p.m. Passengers just "come out to the airport and board . . .. If you wish you may pay your fare on the plane."

From the start of services on April 30 until August 26, more than 98.2 per cent of scheduled flight departures were on time or within 15min of schedule. During the summer period 92.8 per cent of scheduled flight arrivals were on time or within 15min of the schedule, extra sections not included. All the flights use a special new "air shuttle" terminal at La Guardia Airport. (The term Air Shuttle, like Air Bus, has been registered by the airline.) This terminal is adjacent to metered and overnight car parks and it has an attractive snack bar, newsagent's shop and comfortable lounges. It also has a closed-circuit TV system for flight information and self-claim facilities for baggage.

"Flight" photograph

Eastern Air Lines have registered the name Air Bus, proclaimed here on one of the company's Super Constellations which operate cut-price no-reservations services from New York to Washington ($14) and Boston ($12). A note on the operation incol 2

Passengers embark at London Heathrow on the inaugural BEA Vanguard "VLF" (twopence-a-mile) night flight to Glasgow and Edinburgh on November 1. A note about the event is on page 745

AIR COMMERCE...

BRITISH UNITED'S REPORT: A POSTSCRIPT

THE publication by British United Airways of its Report and Accounts, analysed in last week's issue, is a welcome innovation in the history of British private aviation enterprise.

With so much evidence of airlines having over-equipped with new jets the public is interested to know how this will affect them. Will it mean an airline get-together to put fares up? Or will it mean many companies going out of business—and an even tighter grip by the remaining companies through IATA's fare-fixing machinery, and through pooling agreements?

If the smaller private companies can operate at lower cost levels than the big flag lines, the public will not take kindly to fare levels established by price-fixing organizations to protect the expensive practices of the more lavish operators.

In the United Kingdom it had been hoped that a large part of the cut-and-thrust of the public hearings of the new Air Transport Licensing Board would have been devoted to the open exposition of different economic theories. In the event, it seems to have been accepted that the economics of air transport is a private matter between the operator and the Board. Operating cost and profit/loss estimates are contained in private "submissions" to the Board. For example, BEA was prepared to tell the Board about the costing of its new bargain-basement night fares to Scotland, provided they remained confidential. What is the reason for this apparent shyness? The main interest of the public in ATLB hearings—to see that under the new deal, they, the customers, are getting the benefit of all the new opportunities offered by modern aircraft—is thwarted.

So any move that makes the public (which include passengers, politicians, financiers, manufacturers and so on) more knowledgeable in these respects is very welcome. The public has the right to full information about licensed public transport operators —and this goes for the secret air operator's certificate too.

The pity is that British United, having decided to make its accounts public, did not present them in a way the ordinary citizen can understand, and especially in a way which isolates the results of the public transport section of its activities. In his covering letter the chairman, Mr Myles Wyatt, indicates that the report was being issued because "Airlines as a whole seem to dwell more upon their losses . . . " the implication being that BUA as an airline operates profitably. The report is not precise on this point. It merely shows that it is possible for private capital to invest in air transport and allied aviation activities and make some profit. It indicates that diversification—geographical and operational—enables setbacks in one part of the industry to be offset by windfalls in another part.

Perhaps British United is now prepared to be much more specific about its own airline results, so that the public can see whether the practices leading to those results qualifies the airline to operate routes in parallel with the corporations, and more economically. There are a number of points that the airline could now clarify without giving away any secrets of its expertise in aircraft operations.

For example, what profit or loss did its air transport operations contribute to the results? Did Channel Air Bridge make money? Did Straits Air Freight Express? And it would be helpful if operating costs were given, and broken down, and similarly revenues for each category of operation. These, after all, are the kinds of figures which the Board is interested in, and the object of public hearings is thwarted if companies are not prepared to account *publicly* for themselves, as every US carrier—down to the smallest "supplemental"—is required to do each quarter by the CAB.

In fact, the time has arrived when the Board should insist on companies' accounts being produced (including those of BOAC and BEA) in standard form, as is done in the USA, with certain items such as depreciation being on a formula basis. This would require changes in the Companies Act; but laws which protect companies unable adequately to finance public transport operations are not good laws. Clearly, this does not apply to BUA.

Still, British United are to be commended on taking this unusual step. It will be of inestimable benefit both to the industry and the public if it leads to *encouragement des autres*.

BREVITIES

Bonanza Air Lines has taken up its option on a tenth Fairchild F-27A

Air-India has confirmed an order for two further Boeing 707-420s to bring its fleet up to six. Deliveries will be made in March and April next year.

BEA is to resume services to Helsinki after a lapse of ten years. Comet 4Bs will operate four times a week to the Finnish capital, as an extension of the non-stop London-Stockholm service, next April.

British Railways announce that a trip-wire device has been installed along the boundary of Southend Airport to set signals at danger should an aircraft overshoot the runway and block the line, as happened last year.

Mr J. R. Batt of Aviation Traders (Engineering) Ltd writes to correct a statement in Stanley Brogden's recent article "Australia's Domestic Airline Operations" that Ansett has an engineering subsidiary in Hong Kong which has rights for Carvair conversions. All rights are at the moment confined to Aviation Traders (Engineering) Ltd.

Sierra Leone Airways, which is managed by British United, is to begin a new non-stop weekly Britannia service between London and Freetown on November 16. Operations began with Twin Pioneers on domestic routes last March. A Heron is to augment these services this month.

BOAC is to introduce Boeing 707s on some eastern route services to Hong Kong and Singapore "early next year." This will release Comets for deployment on routes to West Africa. Comets will replace Britannias chartered to Nigeria Airways on Lagos-London, and will also displace Britannias on the London-Lagos route.

Information is now available from IATA about traffic in the peak North Atlantic season, i.e., during the third-quarter months of July, August and September. Revenue passengers amounted to 690,722 (90 per cent of them economy), an increase of only 3.1 per cent on the corresponding period last year. At the same time the number of seats offered were increased by 34.8 per cent, causing load factor to fall by 16.1 points to 52.6 per cent.

Work is in hand on the extension of Nairobi Embakasi's main runway to 13,500ft. Work is expected to be completed before the end of next year.

A Panair do Brasil DC-7C on a flight from Lisbon to Brazil crashed and caught fire on the approach to Recife on November 1. Of the 76 passengers and crew of nine on board, 48 are reported to have been killed. One report said that the survivors included two of the crew.

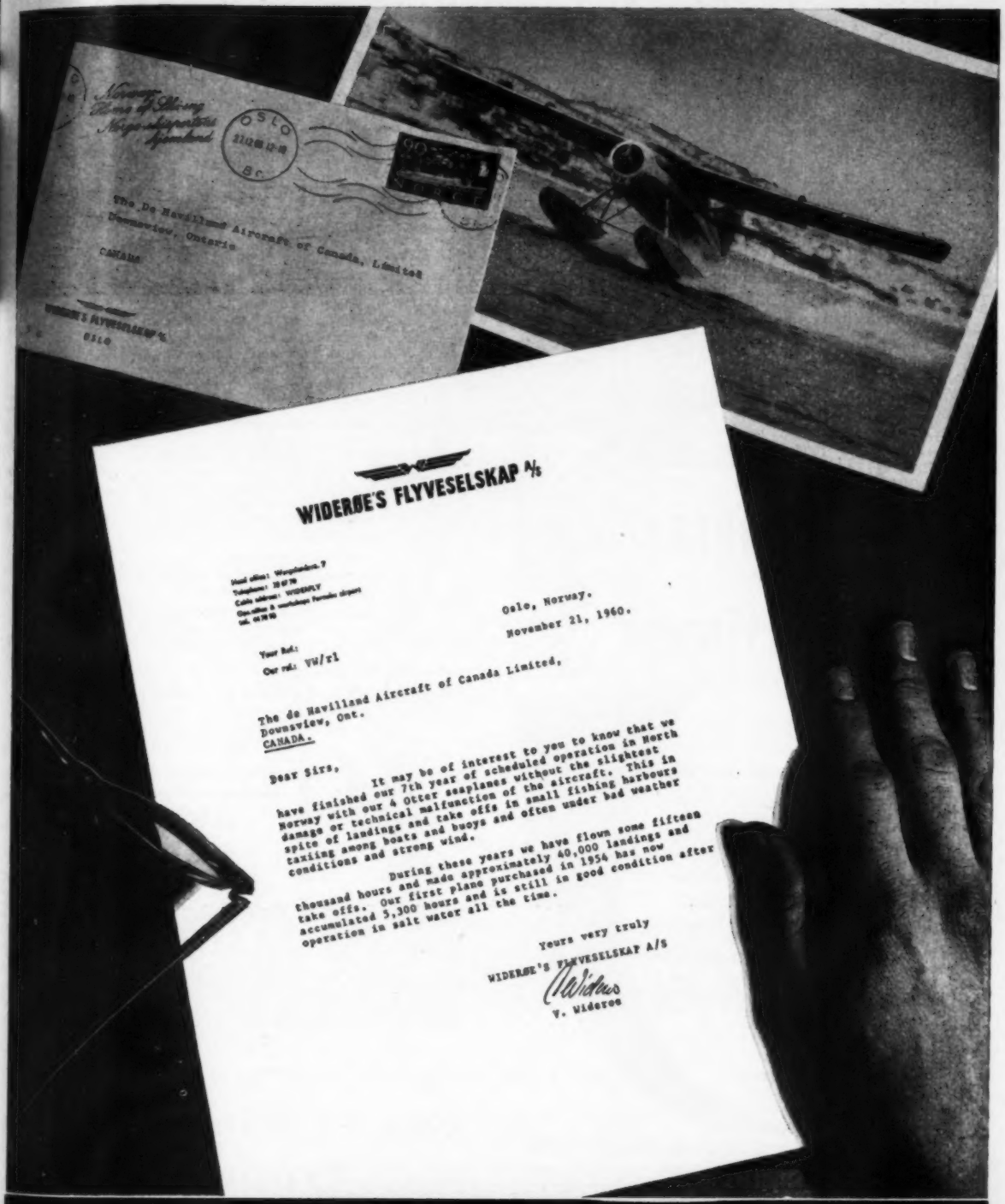
British United Airways Viscount G-AODH crash-landed during an ILS approach monitored by GCA at Frankfurt Airport on October 30. The aircraft was extensively damaged. A stewardess and a passenger were injured. Commander of the aircraft was Capt D. A. Woolfe; the aircraft was on a flight from Berlin to Frankfurt on a BEA charter.

Handley Page Herald 200 G-ARTC left Hurn on November 6 on a 12,000-mile, five-week demonstration tour of southern Europe, the Near East and East Africa. Ten Handley Page staff led by Mr J. W. Allam were to be on board. Among the places to be visited are Rome, Pescara and Taranto (for demonstrations to ALI Itavia), Ethiopia, Aden, Sudan, Cyprus, Jordan and Switzerland.

A Silver City Bristol 170 Freighter Mk 32, G-ANWL, overshot the runway at Guernsey while landing in fog on November 1, and crashed three miles north-west of the airport. The airline's senior pilot, Ft Capt G. Hogarth, and First Officer D. C. Evans were both killed. The seven passengers and the steward escaped serious injury. Three cars on board the aircraft, which was on a flight from Cherbourg, were badly damaged. This was Silver City's first accident in more than 250,397 cross-Channel flights since 1948.

More than 1,000,000hr have been recorded by Boeing jet airliners since the first 707 went into service with Pan American on October 26, 1958. Some 95 per cent of this total represents revenue hours. A total of 29,421m passenger-miles have been flown by Boeing jets.

Pan American's 52 Boeing and Douglas jets have flown more than 240,000hr, and have carried almost 20m passengers, since services began on October 26, 1958. Inflight engine failures have been experienced by PanAm once per 40,000hr and inflight shut-downs have been necessary once every 5,000hr.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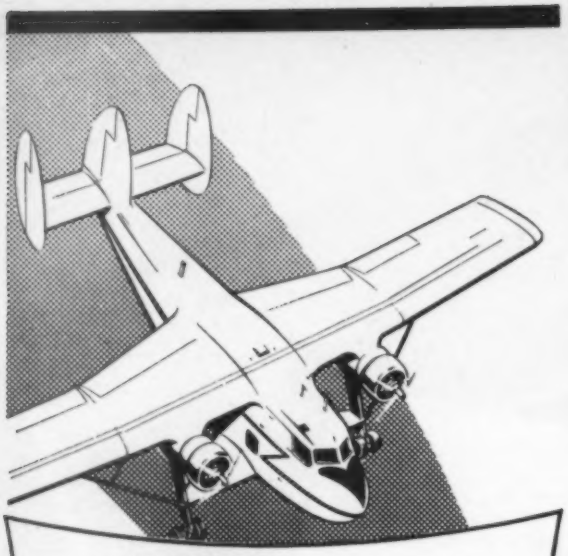

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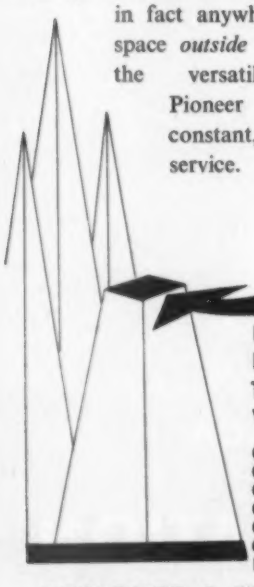

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Persons who wish to receive copies of this official record and whose names are *not* already on the circulation list should make application in writing to the Secretary, Air Transport Licensing Board, Therese House, 29-30 Glasshouse Yard, Aldersgate Street, E.C.1.

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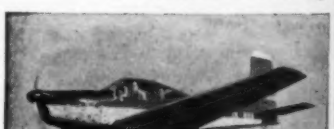

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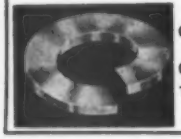

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